

UNCLASSIFIED

ADA 141 810

**U. S. N A V Y  
HINDCAST SPEC  
WAVE MODEL C  
NORTH ATLANT**

**OCTOBER 1983**

**PREPARED BY**

**NAVAL OCEANOGRAPHY COMMAND DETA**

**PREPARED UNDER**

**COMMANDER, NAVAL OCEANOGRA**

**NSTL, MS 39529**

**FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS, U.S. GOV'T.**

1 ①

2

10

339.00 per copy

NAVAIR 5

# NAVY CAST SPECTRAL OCEA MODEL CLIMATIC AT H ATLANTIC OCEAN

83

DEL  
APR  
1983

OGRAPHY COMMAND DETACHMENT, ASHEVILLE, N.C.

DER  
R, NAVAL OCEANOGRAPHY COMMAND

This document has been approved  
for public release and sale; its  
distribution is unlimited.

Copy available to DA  
Permit fully legible

ERINTENDENT OF DOCUMENTS, U.S. GOV'T. PRINTING OFFICE, WASH., D.C. 20402

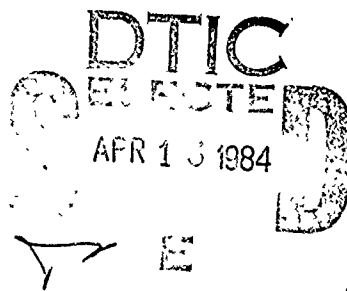
2

(2)



539.00 per copy  
NAVAIR 50-1C-538

# CENTRAL OCEAN CLIMATIC ATLAS: TROPICAL OCEAN



ATTACHMENT, ASHEVILLE, N.C.

OCEANOGRAPHY COMMAND

This document has been approved  
for public release and sale; its  
distribution is unlimited.

PRINTING OFFICE, WASH., D.C. 20402

Copy available to DTIC does not  
represent fully legible reproduction



UNCLASSIFIED

## **DISCLAIMER NOTICE**

**THIS DOCUMENT IS BEST QUALITY  
PRACTICABLE. THE COPY FURNISHED  
TO DTIC CONTAINED A SIGNIFICANT  
NUMBER OF PAGES WHICH DO NOT  
REPRODUCE LEGIBLY.**

# FOREWORD

Based upon previous atlas work prepared at the National Climatic Data Center for the Naval Oceanography Command Detachment, Asheville, it was recognized that there was a need for an objective climatology of the wave environment. An ad hoc committee of wave experts was established to pursue this idea.

The development of a Spectral Ocean Wave Model (SOWM) by Dr. Willard J. Pierson, Dr. Ledolf Baer, Dr. J. Tick, and Dr. R. Salfi, and the operational implementation of this model by Fleet Numerical Oceanography Center FLENUMOCEANCEN made it possible to attempt such a project. The SOWM was used to generate spectral wave data at FLENUMOCEANCEN using historical wind and pressure fields. The model was run in a hindcast mode, and produced 20 years of data for the North Atlantic Ocean on which this atlas is based.

## ACKNOWLEDGEMENT

This atlas was prepared under the Commander, Naval Oceanography Command and coordinated by the Naval Oceanography Command Detachment, Asheville, North Carolina. Work was

performed by the National Climatic Data Center

Specific acknowledgement is made to members of the National Climatic Data Center: project manager, Mr. Robert G. Quayle; project leader, Mr. Thomas R. Karl; Mr. Ronald G. Baldwin for his computer programming; Mr. Joe D. Elms for his isopleth analyses and consultations; Mr. Robert H. Courtney and his assistants, Ms. Tammy E. Buchanan, for their technical work; Ms. Pamela J. Young, Ms. Elaine H. Mason, Ms. Laura K. Metcalf for their data processing assistance; and Mrs. Phyllis E. Taylor for initial typing of the text and to Ms. Williams, Ms. Connie Gray, Mrs. Juanita Lane and Mrs. Suzanne Reed for the final typing of the text.

Credit is also given to Ms. Susan Baldrick, Dr. William Cummins, and Mr. Gregory Neushaffer of the David Taylor Naval Research and Development Center; Mr. Shelton Lazanoff previously of Fleet Numerical Oceanography Center; Dr. Ledolph Baer of the National Ocean Survey; LCDR A. K. Trapp; Mr. Brian Wallace of the Naval Oceanography Command Detachment, Asheville; Dr. Willard Pierson of New York University; and Ms. Margaret Gentile of Operations Research, Inc., for their comments and suggestions.



Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
39.00	
620.	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	23

STOCK NO. 008

performed by the National Climatic Data Center.

2

Specific acknowledgement is made to members of the National Climatic Data Center: project manager, Mr. Robert G. Quayle; project leader, Mr. Thomas R. Karl; Mr. Ronald G. Baldwin for his computer programming; Mr. Joe D. Elms for his isopleth analyses and consultation; Mr. Robert H. Courtney and his assistant, Ms. Tammy E. Buchanan, for their technical work; Ms. Pamela J. Young, Ms. Elaine H. Mason, and Ms. Laura K. Metcalf for their data processing assistance; and Mrs. Phyllis E. Taylor for the initial typing of the text and to Ms. Emma Williams, Ms. Connie Gray, Mrs. Juanita Lanham, and Mrs. Suzanne Reed for the final typing of the text.

prepared at the Naval  
eville, it  
ed for an  
environment.  
ports was  
  
Ocean Wave  
Pierson,  
R. Salfi,  
this model  
Center  
tempt such  
generate  
EN using  
The model  
duced 20  
Ocean on

Credit is also given to Ms. Susan Bales, Dr. William Cummins, and Mr. Gregory F. Neushaffer of the David Taylor Naval Ship Research and Development Center; Mr. Sheldon Lazanoff previously of Fleet Numerical Oceanography Center; Dr. Ledolph Baer of the National Ocean Survey; LCDR A. K. Trapp and Mr. Brian Wallace of the Naval Oceanography Command Detachment, Asheville; Dr. Willard Pierson of New York University; and Ms. Dana Gentile of Operations Research, Inc., for their comments and suggestions.

under the  
mand and  
y Command  
Work was

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	CA



STOCK No. 008-042-000 74-8

## TABLE OF CONTENTS

	Page
Foreword and Acknowledgement.....	iii
Introduction.....	v
Background.....	vi
Overview.....	vii
Isopleth Presentations.....	1-52
Contingency Tables.....	53-208
Duration-Interval Tables.....	209-348
Appendix A-SOWM Development.....	349-350
Appendix B-The FIB Technique.....	351
Appendix C-Parameter Derivations.....	352-354
Appendix D-Some Applications of Contingency Tables.....	355-356
Appendix E-Duration and Interval Tables.....	357-359
Appendix F-Comparison of SOWM with Other Climatologies.....	360-374
Bibliography.....	375

### ISOPLETHS

WIND SPEED ( $\leq 10$ and $\geq 34$ KNOTS)	
WAVE HEIGHT ( $< 5$ and $< 8$ FEET)	
WAVE HEIGHT ( $\geq 12$ and $\geq 20$ FEET)	
WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ and $\geq 0.10$ )	

### CONTINGENCY TABLES

WIND DIRECTION AND SPEED	
WAVE HEIGHT AND WIND SPEED	
WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )	
WAVE HEIGHT AND PERIOD	
WAVE HEIGHT AND DIRECTIONALITY	
WAVE HEIGHT AND PRIMARY WAVE DIRECTION	
PRIMARY WAVE DIRECTION AND WIND DIRECTION	

### DURATION-INTERVAL TABLES

WIND SPEED DURATIONS	
WIND SPEED INTERVALS	
WAVE HEIGHT DURATIONS	
WAVE HEIGHT INTERVALS	
WAVE SLOPE ( $\alpha$ ) DURATIONS	
WAVE SLOPE ( $\alpha$ ) INTERVALS	
WAVE HEIGHT AND SLOPE ( $\alpha$ ) DURATION	
WAVE HEIGHT AND SLOPE ( $\alpha$ ) INTERVALS	

# PAGE INDEX

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49	50	51	52
53	54	55	56	57	58	59	60	61	62	63	64	65
66	68	70	72	74	76	78	80	82	84	86	88	90
92	94	96	98	100	102	104	106	108	110	112	114	116
118	120	122	124	126	128	130	132	134	136	138	140	142
144	146	148	150	152	154	156	158	160	162	164	166	168
170	172	174	176	178	180	182	184	186	188	190	192	194
196	197	198	199	200	201	202	203	204	205	206	207	208
209	212		215			218	221		224			227
230	233		236			239	242		245			248
251	254		257			260	263		266			269
272	275		278			281	284		287			290
293	296		299			302	305		308			311
314	317		320			323	326		329			332
335	336		337			338	339		340			341
342	343		344			345	346		347			348

## INTRODUCTION

Existing wave climatologies are primarily based on visual ship observations. These climatologies may be unreliable, particularly in data-sparse regions. Shipborne wave recorders have provided reliable wave data for selected areas of the oceans, but a scarcity of these data remains. This pilot atlas introduces a new, numerically derived, historical data set in the form of a wind and wave climatology. It is intended to provide the design, scientific and operational communities a more accurate representation of the overall wave climate of the North Atlantic Ocean than is available from other sources.

## BACKGROUND

In December 1974 the Fleet Numerical Oceanography Center FLENUMOCEANCEN in conjunction with the Naval Oceanographic Office (NAVOCEANO) adopted the Spectral Ocean Wave Model (SOWM) developed by Dr. Willard J. Pierson and others to produce operational spectral wave data for the Northern Hemisphere. The SOWM is a computer-based procedure that produces a directional variance spectrum at specified grid points spaced at up to 180 nautical mile intervals. This spectrum defines the sea surface at each grid point through a two-dimensional (direction/frequency) matrix of 12 directions and 15 frequency bands. Further information on the theoretical basis of the SOWM is contained in Appendix A.

At the Seakeeping Workshop in July 1975, the rationale and structure of a hindcast wind and wave climatology was developed. It was concluded at that time that the hindcast climatology be intended to provide a statistical basis for evaluating the effects of the environment.

A jointly funded project by the U. S. Navy, the National Oceanic and Atmospheric Administration (NOAA), and the Department of Defense in the 1960's and early 1970's had assembled a data base containing ship observations as far back as 1854. A major goal

of the effort was to produce a marine environmental history. In 1976, this new historical data base was combined with existing pressure analyses to produce a reanalysis of Northern Hemisphere sea-level pressure on a 63 x 63 grid at 00Z, 06Z, 12Z, and 18Z. The reanalysis was performed by Meteorology International, Inc. (MII) using a comprehensive technique for the objective analysis of scalar and vector fields called "Fields by Information Blending" (FIB) Mendenhall et al. (1977).

Once the pressure fields were produced, wind fields (speed and direction) were computed. Using these modeled winds, FLENUMOCEANCEN generated a spectral wave field, which was forwarded to the David Taylor Naval Ship Research and Development Center (DTNSRDC) for analysis. Appendix B provides further information on the FIB technique and on the generation of the wind fields.

In order to summarize a set of spectra, it is often useful to generalize the most significant characteristics. DTNSRDC, with Operations Research, Inc. (ORI), developed computer programs to derive a number of numerical parameters from the spectral wave data. The National Climatic Data Center (NCDC) used many of the concepts from these programs and others written by FLENUMOCEANCEN to devise a parameterization routine which was used for this atlas.



# OVERVIEW

## I. PARAMETERS

This atlas contains climatological summaries for seven parameters. Four of these parameters have already been summarized in other climatic atlases (U. S. Navy, 1974). These include wind speed and direction, significant wave height (hereafter referred to as the wave height), and wave direction, i.e., the direction from which the highest waves are moving (hereafter referred to as primary wave direction). The other three parameters contained in the wave climate summaries for this atlas are: wave slope parameter, modal wave period, and directionality of the waves (hereafter referred to as the directionality). These three parameters have not appeared in previous U. S. Navy climatological atlases, because they cannot be directly derived from visual observations. However, they can be very important operating considerations. Appendix C provides a complete description of all seven parameters. A brief description of the wave slope parameter, modal wave period, and directionality follows.

The wave slope of a regular wave is defined as the ratio of wave height to wave length. It is not normally reported, but it can be obtained from the output of the SOWM or from the frequency spectrum of a wave record. Ship rolling and hence stability is affected by the wave slopes of the higher waves encountered. The wave slope parameter is directly related to the wave slope. Therefore, the higher the wave slope parameter, the higher the wave slope. Table C3 in Appendix C relates the wave slope parameter to values of the wave slope at a fixed point. Steep waves are usually associated with wave slope parameters of 0.10 or more, while values of less than 0.05 are usually associated with more moderate conditions.

The modal wave period is defined in terms of the frequency spectrum. It is the period associated with the maximum wave energy in the wave spectrum. Modal wave periods associated with wave lengths about 0.75 and 1.25 ship lengths (depending on ship course and speed) can cause resonance pitching and heaving. The modal

wave period is not necessarily equal to the wave period associated with the higher of the two waves, the sea or the swell as summarized in the past U. S. Navy climatologies (U. S. Navy, 1974).

The directionality is a measure of the uniformity of the direction of movement of the waves. If the waves are all moving in a uniform direction then the directionality is equal to one. When there is no preferred direction of wave movement (a completely confused sea state) the directionality takes on the value of 0. Obviously, ship response and maneuverability can be affected by the directional spread of the wave energy.

## II. DATA DISPLAYS

### ISOPLETH ANALYSES

Isopleth analyses were completed for various thresholds for the percent frequency of wind speed, wave height, and the wave slope parameter. These analyses were based on 81 grid points, 63 of which are labeled and also used in tabular presentations, the remaining 18 being used strictly as analysis aids. All points are shown on the North Atlantic map (Fig. 1) and the 63 grid points are listed in Table 1.

Computer processing difficulties during the generation of the SOWM hindcast data caused the number of hindcasts to vary among grid points. As a result, approximately 0.5% of all the data were lost during the 20-year hindcast period, 1956-1975. This small percentage is unlikely to have any significant effect on the analyses for the 20-year period.

Isopleth analyses were omitted in areas of poor data coverage, mainly along the coasts of the continents. The gray line on the North Atlantic map (Fig. 1) displays this boundary. Isopleth detail is also limited by the grid spacing of the 81 data points. This is probably most pronounced near land and ice boundaries.

## CONTINGENCY TABLES

Contingency tables for 63 grid points are presented for the following elements:

is not necessarily equal to the wave associated with the higher of the two seas or the swell as summarized in the Navy climatologies (U. S. Navy,

directionality is a measure of the of the direction of movement of the waves are all moving in a uniform when the directionality is equal to there is no preferred direction of at (a completely confused sea state) nality takes on the value of 0. ship response and maneuverability can by the directional spread of the

- (1) Wind direction and speed;
- (2) Wave height and wind speed;
- (3) Wave height and wave slope parameter;
- (4) Wave height and period;
- (5) Wave height and directionality;
- (6) Wave height and primary wave direction;
- (7) Primary wave direction and wind direction.

## I. DATA DISPLAYS SOPLETH ANALYSES

h analyses were completed for thresholds for the percent frequency of wave height, and the wave slope. These analyses were based on 81 grid of which are labeled and also used in entations, the remaining 18 being y as analysis aids. All points are North Atlantic map (Fig. 1) and the ts are listed in Table 1.

r processing difficulties during on of the SOWM hindcast data caused of hindcasts to vary among grid a result, approximately 0.5% of all lost during the 20-year hindcast 1975. This small percentage is ave any significant effect on the the 20-year period.

analyses were omitted in areas of erage, mainly along the coasts of s. The gray line on the North (Fig. 1) displays this boundary. il is also limited by the grid e 81 data points. This is probably ed near land and ice boundaries.

## CONTINGENCY TABLES

ncy tables for 63 grid points are i for the following elements:

The values in these tables are percent frequencies rounded to the nearest whole percent. Values less than 0.5% but greater than 0.005% are depicted by a '+'.

The left side of each contingency table has a percentage scale for the bar graphs associated with the categories indicated along the bottom of the table. The height of the bar graphs was determined by adding the values within each column. Similarly, the percent frequencies in the column denoted by a 'T' (total) were obtained by summing the percent frequencies across each row. Rounding may cause minor differences between printed totals and total cell counts. By adding down or up the 'T' column or across the bar graphs at the bottom of the table, it is possible to obtain the cumulative percent frequency of a parameter below or above some specified threshold value.

In the following four contingency tables: wind direction and speed, wave height and wind speed, wave height and wave slope, and wave height and directionality the mean value of one of the two parameters associated with each contingency table is displayed just above the upper left corner. The number of hindcasts that was available for all seven tables is also shown at the top of each table. When SOWM hindcast data were not retained due to insufficient wave energy, all parameters were assumed to be zero including the wind speed and direction. Wind speeds were rounded to the nearest whole knot before tabulating the



# SUBPROJECTION AND SEQUENCE NUMBERS

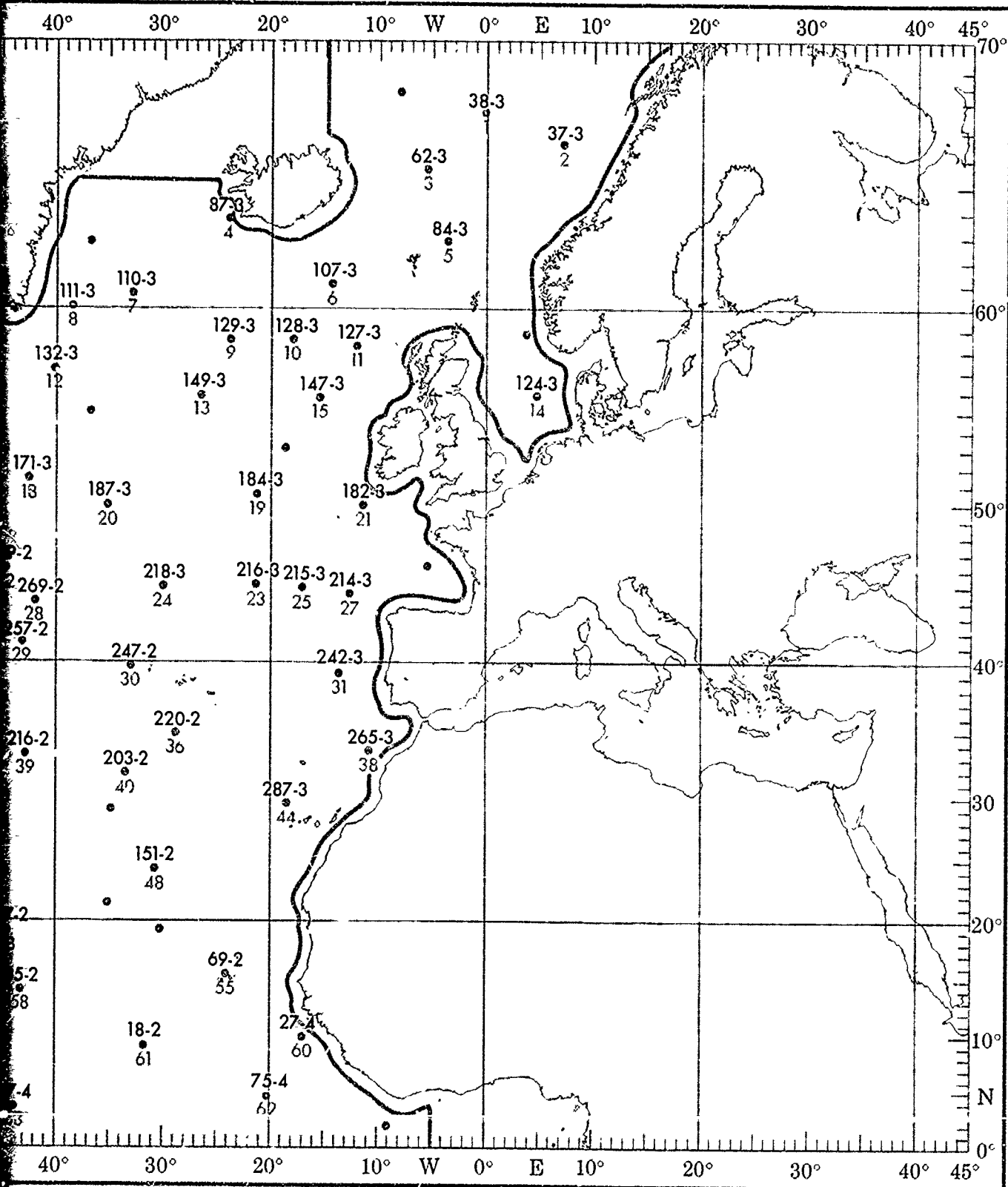


TABLE 1

## GRID POINTS INCLUDED IN TABULAR SUMMARIES

SEQUENCE #	GRID POINT SUBPROJECTION	LATITUDE	LONGITUDE
1	38 - 3	67.7 N	.4 W
2	37 - 3	66.6 N	6.8 E
3	62 - 3	65.7 N	5.8 W
4	87 - 3	63.8 N	24.1 W
5	84 - 3	62.9 N	3.9 W
6	107 - 3	61.1 N	14.6 W
7	110 - 3	60.7 N	33.1 W
8	111 - 3	60.1 N	38.7 W
9	129 - 3	58.6 N	24.0 W
10	128 - 3	58.6 N	18.2 W
11	127 - 3	58.3 N	12.3 W
12	132 - 3	57.2 N	40.3 W
13	149 - 3	55.9 N	26.7 W
14	124 - 3	55.9 N	4.4 E
15	147 - 3	55.8 N	15.7 W
16	134 - 3	55.4 N	49.3 W
17	304 - 2	52.6 N	49.9 W
18	171 - 3	51.5 N	42.7 W
19	184 - 3	50.6 N	21.5 W
20	187 - 3	50.0 N	35.4 W
21	182 - 3	50.0 N	11.7 W
22	279 - 2	46.2 N	44.9 W
23	216 - 3	45.2 N	21.6 W
24	218 - 3	45.1 N	30.2 W
25	215 - 3	45.0 N	17.3 W
26	277 - 2	44.8 N	53.1 W
27	214 - 3	44.6 N	12.9 W
28	269 - 2	44.1 N	42.1 W
29	257 - 2	41.4 N	43.3 W
30	247 - 2	39.8 N	33.2 W
31	242 - 3	39.3 N	13.9 W
32	263 - 2	38.8 N	65.1 W

SEQUENCE #	GRID POINT SUBPROJECTION	LATITUDE	LONGITUDE
33	243 - 2	37.9 N	48.2 W
34	261 - 2	36.1 N	71.8 W
35	240 - 2	35.1 N	59.3 W
36	220 - 2	35.0 N	29.0 W
37	228 - 2	34.1 N	52.9 W
38	265 - 3	33.7 N	11.1 W
39	216 - 2	33.4 N	43.0 W
40	203 - 2	32.0 N	33.7 W
41	214 - 2	31.9 N	50.2 W
42	222 - 1	30.4 N	77.9 W
43	224 - 2	29.7 N	66.5 W
44	287 - 3	29.7 N	18.7 W
45	211 - 2	29.0 N	60.5 W
46	210 - 1	28.8 N	86.7 W
47	182 - 2	26.7 N	48.5 W
48	151 - 2	24.4 N	30.9 W
49	207 - 2	24.2 N	72.8 W
50	226 - 1	24.0 N	89.4 W
51	161 - 2	20.8 N	59.1 W
52	262 - 1	19.9 N	80.8 W
53	127 - 2	19.2 N	44.7 W
54	124 - 2	16.7 N	54.2 W
55	69 - 2	15.5 N	24.3 W
56	139 - 2	14.7 N	68.4 W
57	283 - 1	14.1 N	80.8 W
58	85 - 2	14.1 N	43.4 W
59	81 - 2	10.8 N	55.5 W
60	27 - 4	10.0 N	17.2 W
61	18 - 2	9.2 N	31.9 W
62	75 - 4	4.7 N	20.4 W
63	37 - 4	3.7 N	44.0 W

frequency statistics. Directions are those from which the wind or wave is coming. Detailed instructions describing how to read each of the various types of contingency tables are contained in the 'Legends for Tables'. Some potential uses for the contingency tables are demonstrated in Appendix D.

## DURATION AND INTERVAL TABLES

Duration and Interval Tables were prepared for:

- (1) Wind speed;
- (2) Significant wave height;
- (3) Wave slope parameter.

The tables contain objective compilations for selected months for 63 grid points. Since grid points may be representative of relatively small geographical areas surrounding the points, interpolation may be necessary if data are required for areas between grid points.

In order to prevent the atlas from becoming overly voluminous, the duration and interval tables are presented for only six months - January, February, April, July, August, October - and a summary table which includes all the hindcasts. These months were chosen to show detail in winter (January and February) and summer (July and August), with only one month for each transition season (April and October) (World Meteorological Organization, 1981). Episodes of durations (continuous hours or days) of events and episodes of intervals (continuous hours or days) between events were tallied for various thresholds. These tables give an indication of how long an episode is likely to last once it has begun. For convenience, the time an episode persisted above a given threshold is arbitrarily referred to as a "duration" of the event. The times in between episodes have been termed "intervals." Additional information on the construction and use of the duration and interval tables, including examples of their applications, is included in Appendix E and in the 'Legends for Tables.'

ES	LATITUDE	LONGITUDE
N	48.2 W	
N	71.8 W	
N	59.3 W	
N	29.0 W	
N	52.9 W	
N	11.1 W	
N	43.0 W	
N	33.7 W	
N	50.2 W	
N	77.9 W	
N	66.5 W	
N	18.7 W	
N	60.5 W	
N	86.7 W	
N	48.5 W	
N	30.9 W	
N	72.8 W	
N	89.4 W	
N	59.1 W	
N	80.8 W	
N	44.7 W	
N	54.2 W	
N	24.3 W	
N	68.4 W	
N	80.8 W	
N	43.4 W	
N	55.5 W	
N	17.2 W	
N	31.9 W	
N	20.4 W	
N	44.0 W	

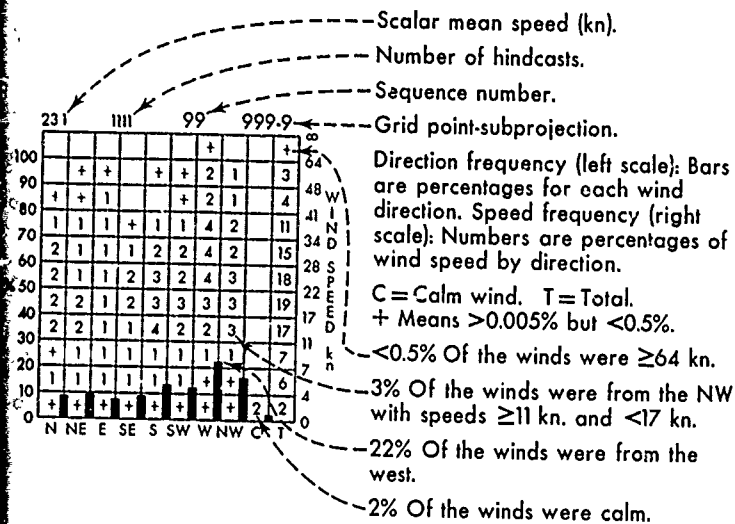
### III. COMPARISON OF THE SOWM CLIMATOLOGY WITH OTHER WAVE CLIMATOLOGIES

Undoubtedly, the SOWM hindcast climatology as presented in this atlas, varies in its strengths and weaknesses from location to location and even from parameter to parameter. In the absence of a substantial quantity of measured wave spectra across the North Atlantic Ocean, a strict verification of the SOWM hindcast climatology is not possible. Nonetheless, some cogent information can be derived regarding the representativeness of the SOWM climatology via comparisons with other wind and wave climatologies. Appendix F contains some comparisons of the SOWM climatology with wave climatologies derived from other sources.

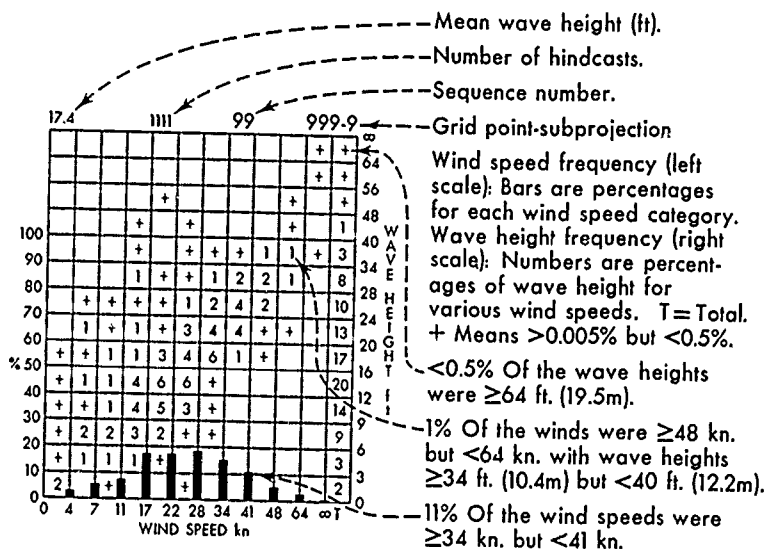
These comparisons indicate that some disagreements exist between data sources. The user should be aware of these differences when making decisions based on the North Atlantic SOWM Atlas or other wave climatologies. Overall, this atlas should prove to be a highly useful product especially when used in conjunction with conventional wave climatologies. It provides extensive wave data on a basin wide scale, including details which cannot be inferred from the only other basin wide data set available, the 1974 U. S. Navy North Atlantic Marine Climatic Atlas. User feedback concerning the North Atlantic SOWM pilot atlas data accuracy, utility, or format is solicited. Please address your comments to the Officer in Charge; Naval Oceanography Command Detachment; Federal Building, Asheville, NC 28801.

# LEGENDS FOR TABLES

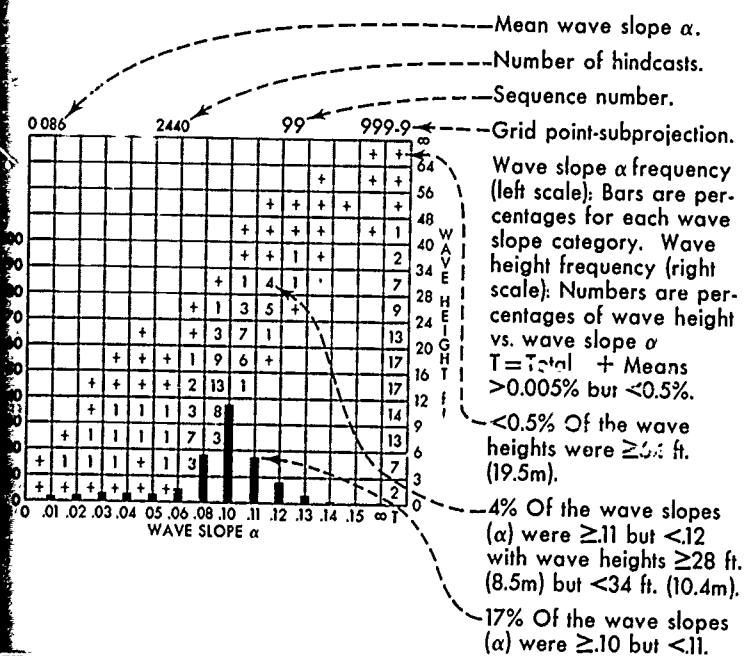
## WIND DIRECTION AND SPEED



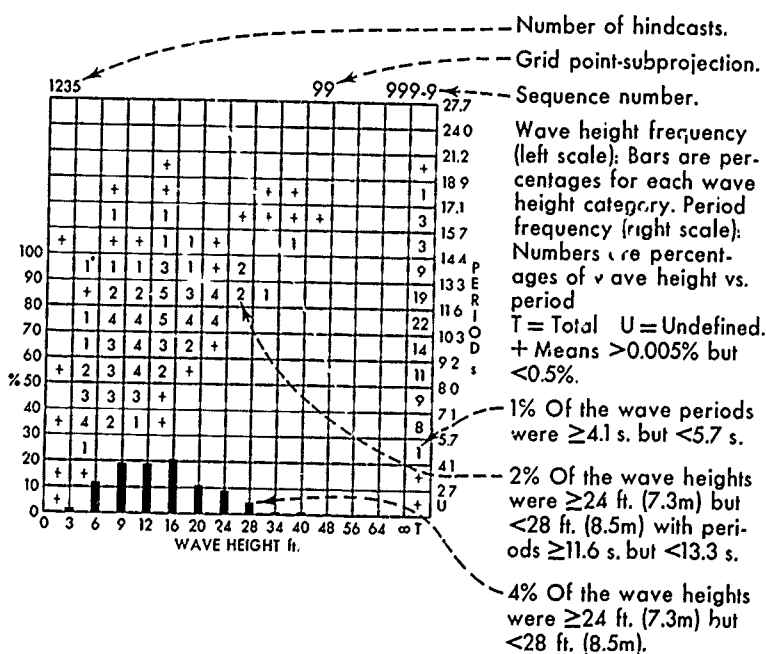
## WAVE HEIGHT AND WIND SPEED



## WAVE HEIGHT AND WAVE SLOPE $\alpha$



## WAVE HEIGHT AND MODAL WAVE PERIOD



feet 9 16 24  
0.3 6 12 20 28 34 40 48 56 64  
meters 0.9 1.8 3.7 6.1 8.5 11.2 14.6 17.1 19.5  
0.9 2.7 4.9 7.3 10.4





## WIND SPEED DURATIONS - MONTHLY

		SEQUENCE NUMBER 99										GRID POINT SUBPROJECTION NUMBER 999.9									
WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED
≥64	3	1	1									181	5	9	9	1235					
≥48	13	3	3	2								302	21	38	38	1235					
≥34	12	10	9	2	1	3	1	1				481	39	105	105	1235					
≥28	25	20	15	3	7	3	1	1	2	1		781	79	231	236	1235					
≥22	20	12	25	12	6	5	4	4	3	4	1	962	101	440	449	1250					
≥17	16	13	19	15	9	6	7	3	5	1	6	144	114	656	670	1258					
≥11	6	10	10	8	14	8	5	4	5	7	2	354	107	945	959	1269					
≥7	7	1	6	3	2	5	3	2	4	3	6	3	2	1	3	26	MO 2	77	1078	1153	1273
≥4	3	1	2	3	1							25	426	41	1336	1443	1483				
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96+	MAX	TE	T	T*	TH

1 Event with wind speeds  $\geq 7$  kn. persisted 12 hours, 26 events persisted  $\geq 96$  hours.

The longest event with wind speeds  $\geq 7$  kn. persisted for 1 month or more and it occurred 2 times.

The longest event with wind speeds  $\geq 48$  kn. persisted 18 hours and it occurred 1 time.

41 Events had wind speeds  $\geq 4$  kn. which comprised a total of 1,336 hindcasts.

1,483 Hindcasts were examined, and 1,443 had wind speed  $\geq 4$  kn.

Durations for a particular month extend from the time the event begins (or the first of the month if already in progress), and terminate when the event ends. Events become undefined if missing data is encountered. Durations lasting a month or more are categorized together. Durations may persist into the next month(s).

## WAVE HEIGHT INTERVALS - MONTHLY

		SEQUENCE NUMBER 99										GRID POINT SUBPROJECTION NUMBER 999.9															
WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT	WAVE HEIGHT						
≥64													9	744.9	9	1116	1235	1235									
≥48													9	744.9	9	1116	1235	1235									
≥40													9	744.9	9	1116	1235	1235									
≥34													9	744.9	10	1129	1248	1249									
≥28													12	744.10	14	1323	1355	1367									
≥22													14	744.10	18	1512	1537	1563									
≥17													17	744.6	29	1454	1475	1549									
≥12													21	744.1	45	1376	1395	1575									
≥8													24	690.1	55	1071	1083	1406									
≥6													5	12	309.1	74	675	675	1254								
≥4													2	3	4	186.1	72	431	431	1241							
≥3													1	1	132.1	47	189	189	1235								
≥2													30	10	13	23	23	1235									
≥1																											
≥0.5																											
≥0.1																											
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96+	MAX	TE	T	T*	TH						
	HOURS INTERVALS BETWEEN EVENTS.																										

There were 13 12-hour intervals between events of wave heights  $\geq 9$  ft. (2.7m), 4 intervals persisted 96 hours or more.

The longest interval between events of wave heights  $\geq 6$  ft. (1.8m) was 132 hours and it occurred 1 time.

The longest interval between events of wave heights  $\geq 64$  ft. (19.5m) was 1 month or more and it occurred 9 times.

There were 13 intervals between events of wave heights  $\geq 3$  ft. (0.9m) which comprised a total of 23 hindcasts.

1,235 Hindcasts were examined, and 23 had wave heights  $< 3$  ft. (0.9m).

Intervals for a particular month extend from the time the event ends (or the first of the month if the event is not in progress), and terminate when the event begins. Intervals become undefined if missing data is encountered. Intervals lasting a month or more are categorized together. Intervals may persist into the next month(s).

## ABBREVIATIONS (See text for details)

MAX: Maximum duration or interval, followed by the number of occurrences.

TE or TI: Total number of events or intervals.

T: Total number of hindcasts included in TE or TI.

T\*: Total number of hindcasts that met the stated criteria.

TH: Total number of hindcasts examined.

## LEGENDS FOR TABLES

## WIND SPEED INTERVALS - MONTHLY

		SEQUENCE NUMBER 99										GRID POINT SUBPROJECTION NUMBER 999.9										
WIND SPEED													9	744.9	9	1116	1235	1235				
≥64													11	744.10	14	1298	1364	1373				
≥48													18	744.6	30	1530	1553	1591				
≥34													22	690.1	47	1414	1435	1540				
≥28													3	27	384.1	88	1122	1124	1360			
≥22													13	324.1	106	854	854	1288				
≥17													2	2	4	13	240.1	113	617	617	1264	
≥11													1	1	2	2	108.1	103	310	310	1235	
≥7													1	1	1	1	36.1	68	120	120	1235	
≥4													1	1	1	1	18.1	32	40	40	1235	
≥2																						
≥1																						
≥0.5																						
≥0.1																						
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96+	MAX	TE	T	T*	TH	
	HOURS INTERVAL BETWEEN EVENTS																					

There were 18 12-hour intervals between events of wind speeds  $\geq 17$  kn.; 4 intervals persisted 96 hours or more.

The longest interval between events of wind speeds  $\geq 7$  kn. was 36 hours and it occurred 1 time.

The longest interval between events of wind speeds  $\geq 64$  kn was 1 month or more and it occurred 9 times.

There were 32 intervals between events of wind speeds  $\geq 4$  kn. which comprised a total of 40 hindcasts.

1,235 Hindcasts were examined, and 40 had wind speeds  $< 4$  kn.

Intervals for a particular month extend from the time the event ends (or the first of the month if the event is not in progress), and terminate when the event begins. Intervals become undefined if missing data is encountered. Intervals lasting a month or more are categorized together. Intervals may persist into the next month(s).

WAVE SLOPE  $\alpha$  DURATIONS - MONTHLY

		SEQUENCE NUMBER 99										GRID POINT SUBPROJECTION NUMBER 999.9									
WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE	WAVE SLOPE
≥15												6	1	1	1	1	2440				
≥14												6	2	2	2	2	2440				
≥13												18	1	12	19	19	2442				
≥12												14	1	10	10	96	2446				
≥11												1	1	1	1	1	2448				
≥10												1	1	1	1	1	2477				
≥08												1	1	1	1	1	2477				
≥06												1	1	1	1	1	2477				
≥05												1	1	1	1	1	2477				
≥04												1	1	1	1	1	2477				
≥03												1	1	1	1	1	2477				
≥02												1	1	1	1	1	2477				
≥01												1	1	1	1	1	2477				
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96+	MAX	TE	T	T*	TH

2 Events with  $\alpha \geq 0.02$  persisted 12 hours, 30 events persisted  $\geq 96$  hours.

The longest event with  $\alpha \geq 0.13$  persisted 18 hours and it occurred 1 time.

The longest event with  $\alpha \geq 0.02$  persisted for 1 month or more and it occurred 14 times.

24 Events had  $\alpha \geq 0.01$  which comprised a total of 2,477 hindcasts.

2,659 Hindcasts were examined, and 2,641 had a  $\geq 0.01$ .

Durations for a particular month extend from the time the event begins (or the first of the month if already in progress), and terminate when the event ends. Events become undefined if missing data is encountered. Durations lasting a month or more are categorized together. Durations may persist into the next month(s).

## INTERVALS - MONTHLY

[illegible]

For a particular month extend from the time the event ends (at the end of the month if the event is not in progress), and terminate at the time the event begins. Intervals become undefined if missing values are encountered. Intervals lasting a month or more are concatenated. Intervals may persist into the next month(s).

### $\alpha$ -DURATIONS - MONTHLY

[illegible]

Durations may persist into the next month(s).

Number of occurrences.

### WAVE HEIGHT DURATIONS - MONTHLY

[illegible]

Durations for a particular month extend from the time the event begins (or the first of the month if already in progress), and terminate when the event ends. Events become undefined if missing data is encountered. Durations lasting a month or more are categorized together. Durations may persist into the next month(s).

WAVE SLOPE  $\alpha$  INTERVALS - MONTHLY

		SEQUENCE NUMBER 99																		GRID POINT-SUBPROJECTION NUMBER 999.9											
WAVELENGTH SLOPE ANGLE	≥ 15																			19	744-18	20	2319	2557	2558						
	14																				20	744-18	19	2432	2661	2663					
	13				1	1															25	744-14	28	2657	2895	2912					
	12			1	3	2	1	4					1								38	744-9	54	2708	2922	3012					
	11		12	8	3	6	5	5	1	4	2	1	2	5		3	4	44	744-2	105	2283	2393	2740								
	10		26	7	15	11	7	4	8			6	3	5	4	5	5	1	36	474-1	43	1755	1825	2616							
	9		23	18	10	13	7	10	5	6	4	2	3	4	1	2	4	1	9	348-1	118	762	778	2496							
	8		21	18	18	8	4	3	2		2	4				1	2	1	2	150-1	86	346	355	2450							
	7		25	49	12	4	4	2	2	2	2	3	3	2	2					66	2	77	246	246	2445						
	6		20	18	7	1	6	2	1	1	2	1								66-1	59	167	167	2443							
5		20	18	5	4	3	1			1									48-1	42	96	96	2442								
4		10	1	7	1			1	1										42-1	20	39	39	2442								
3		4	1					1											36-1	6	12	12	2440								
2		01																													
			6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96+	MAX	T1	T2	T3	T4								
		HOURS INTERVALS BETWEEN EVENTS																													

Intervals for a particular month extend from the time the event ends (or the first of the month if the event is not in progress), and terminate when the event begins. Intervals become undefined if missing data is encountered. Intervals lasting a month or more are categorized together. Intervals may persist into the next month(s).

feet	meters
0	0
3	1.8
6	3.7
9	6.1
12	8.5
16	12.2
20	14.6
24	17.1
28	19.5
34	
40	
48	
56	
64	

# LEGENDS FOR TABLES

## WIND SPEED DURATIONS - ALL DAYS

		SEQUENCE NUMBER 99										GRID POINT SUBPROJECTION NUMBER 999-9									
WIND SPEED	WIND SPEED	1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T	T*	TH			
≥4	10	5	1	1	1														13606		
≥41	46	15	6	1	6									125.1	18	32	32	13606			
≥34	62	45	34	15	15	2								175.2	74	131	131	13606			
≥28	173	94	64	29	59	13	3							300.1	173	433	433	13606			
≥22	173	94	64	29	59	13	3							350.1	385	1136	1141	13606			
≥17	137	121	94	77	133	31	12	6	6					825.1	617	2527	2536	13606			
≥11	158	144	100	99	214	75	37	16	17	2				1125.1	862	4590	4605	13606			
≥7	123	107	73	86	251	148	74	53	63	8	2			2275.1	988	8418	8472	13606			
≥4	97	45	38	51	129	126	83	50	135	39	3			2825.1	796	11074	11219	13606			
≥1	30	17	19	14	57	49	41	26	93	68	26	1		11361.00	1422	12384	12640	13606			
		25	5	75	1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T	T*	TH

17 Events with wind speeds  $\geq 4$  kn. persisted 0.5 day; 57 events persisted  $>1$  day but  $\leq 2$  days.

The longest event with wind speeds  $\geq 41$  kn. persisted 1.75 days and it occurred 2 times.

The longest event with wind speeds  $\geq 34$  kn. persisted 3 days and it occurred 1 time.

442 Events had wind speeds  $\geq 4$  kn. which comprised a total of 12,384 hindcasts.

13,606 Hindcasts were examined, and 12,640 had wind speeds  $\geq 4$  kn.

Durations extend from the time the event begins and terminate when the event ends. Events become undefined if missing data is encountered.

## WIND SPEED INTERVALS - ALL DAYS

		SEQUENCE NUMBER 99										GRID POINT SUBPROJECTION NUMBER 999-9									
WIND SPEED	WIND SPEED	1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T	T*	TH			
≥48	5	1												418.00	1	13	5944	13574	13606		
≥41	5	1												324.00	1	68	8829	13475	13606		
≥34	9	7	5	6	22	15	19	4	30	27	9	7	2	1	4		208.50	167	9580	1317	13606
≥28	33	34	20	26	61	43	34	25	46	38	7	7	2	3	1		181.75	380	10399	124.5	13606
≥22	68	63	38	55	132	79	44	27	55	32	9	4	5	2			115.75	613	10594	1107	13606
≥17	113	98	103	75	197	96	42	24	67	36	6	2					50.25	1859	8875	9001	13606
≥11	210	180	150	102	196	62	38	24	20	6							16.25	988	5108	5134	13606
≥7	316	182	104	62	90	25	12	3	4								8.75	2798	2376	2387	13606
≥4	255	106	30	15	35	8											4.625	451	963	966	13606

1 Interval between events of wind speeds  $\geq 48$  kn. persisted 0.5 day; 4 intervals persisted  $>1$  day but  $\leq 2$  days.

The longest interval between events of wind speeds  $\geq 4$  kn. was 6.25 days and it occurred 1 time.

The longest interval between events of wind speeds  $\geq 7$  kn. was 8.75 days and it occurred 2 times.

There were 451 intervals between events of wind speeds  $\geq 4$  kn. which comprised a total of 963 hindcasts.

13,606 Hindcasts were examined, and 966 had wind speeds  $<4$  kn.

Intervals extend from the time the event ends and terminate when the event begins. Intervals become undefined if missing data is encountered.

## WAVE HEIGHT INTERVALS - ALL DAYS

		SEQUENCE NUMBER 99										GRID POINT SUBPROJECTION NUMBER 999-9									
WAVE HEIGHT	WAVE HEIGHT	1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T	T*	TH			
≥48																					
≥41																					
≥34																					
≥28																					
≥22																					
≥17																					
≥11																					
≥7																					
≥4																					

1 Interval between events of wave heights  $\geq 34$  ft. (10.4m) persisted 0.5 day; 2 intervals persisted  $>1$  day but  $\leq 2$  days.

The longest interval between events of wave heights  $\geq 3$  ft. (0.9m) was 18.25 days and it occurred 2 times.

The longest interval between events of wave heights  $\geq 40$  ft. was 308.25 days and it occurred 1 time.

There were 401 intervals between events of wave heights  $\geq 3$  ft. (0.9m) which comprised a total of 3,133 hindcasts.

13,606 Hindcasts were examined, and 3,208 had wave heights  $<3$  ft. (0.9m).

Intervals extend from the time the event ends and terminate when the event begins. Intervals become undefined if missing data is encountered.

## WAVE SLOPE $\alpha$ DURATIONS - ALL DAYS

		SEQUENCE NUMBER 99										GRID POINT SUBPROJECTION NUMBER 999-9										
WAVE SLOPE	WAVE SLOPE	1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T	T*	TH				
≥ 0.15	2	3												50.3	5	8		29016				
≥ 0.14	12	5	3											75.3	20	31	31	29016				
≥ 0.13	25	15	15	5	4									150.2	64	142	145	29016				
≥ 0.12	48	47	32	21	29	2	1							325.1	180	525	531	29016				
≥ 0.11	120	76	47	46	108	27	3	3						425.3	430	1633	1643	29016				
≥ 0.10	210	139	104	81	183	99	31	15	16					950.1	878	4415	4450	29016				
≥ 0.08	216	128	104	105	265	206	116	69	138	40	4			2375.1	1411	14261	14466	29016				
≥ 0.06	124	104	76	75	241	155	129	99	197	88	18	5		3550.1	1311	20361	20904	29016				
≥ 0.05	135	81	70	55	200	138	110	94	192	100	24	12		4300.1	1211	21835	22909	29016				
≥ 0.04	120	75	60	51	88	115	97	66	171	106	36	19		5850.1	1111	22954	24429	29016				
≥ 0.03	94	58	45	44	119	82	82	53	147	95	45	28	3	67.75	895	23326	25663	29016				
≥ 0.02	69	42	29	18	64	46	51	32	106	68	44	34	9	1	90.75	1613	22003	26905	29016			
≥ 0.01	32	15	11	3	19	10	15	10	34	40	13	45	17	1	1361.75	1267	20760	28054	29016			
	25	5	7.5	1	2	3	4	5	10	20	30	60	90	180	360	∞	MAX	TE	T	T*	TH	
	DAYS, DURATION OF POINT																					

32 Events with  $\alpha \geq 0.01$  persisted .25 day; 19 events persisted  $>1$  day but  $\leq 2$  days.

The longest event with  $\alpha \geq 0.12$  persisted 3.25 days and it occurred 1 time.

The longest event with  $\alpha \geq 0.13$  persisted 1.50 days and it occurred 2 times.

267 Events had  $\alpha \geq 0.01$  which comprised a total of 20,760 hindcasts.

29,016 Hindcasts were examined, and 28,054 had  $\alpha \geq 0.01$ .

Durations extend from the time the event begins and terminate when the event ends. Events become undefined if missing data is encountered.

## ABBREVIATIONS (See text for details)

MAX: Maximum duration or interval, followed by the number of occurrences.

TE or TI: Total number of events or intervals.

T: Total number of hindcasts included in TE or TI.

T\*: Total number of hindcasts that met the stated criteria.

TH: Total number of hindcasts examined.

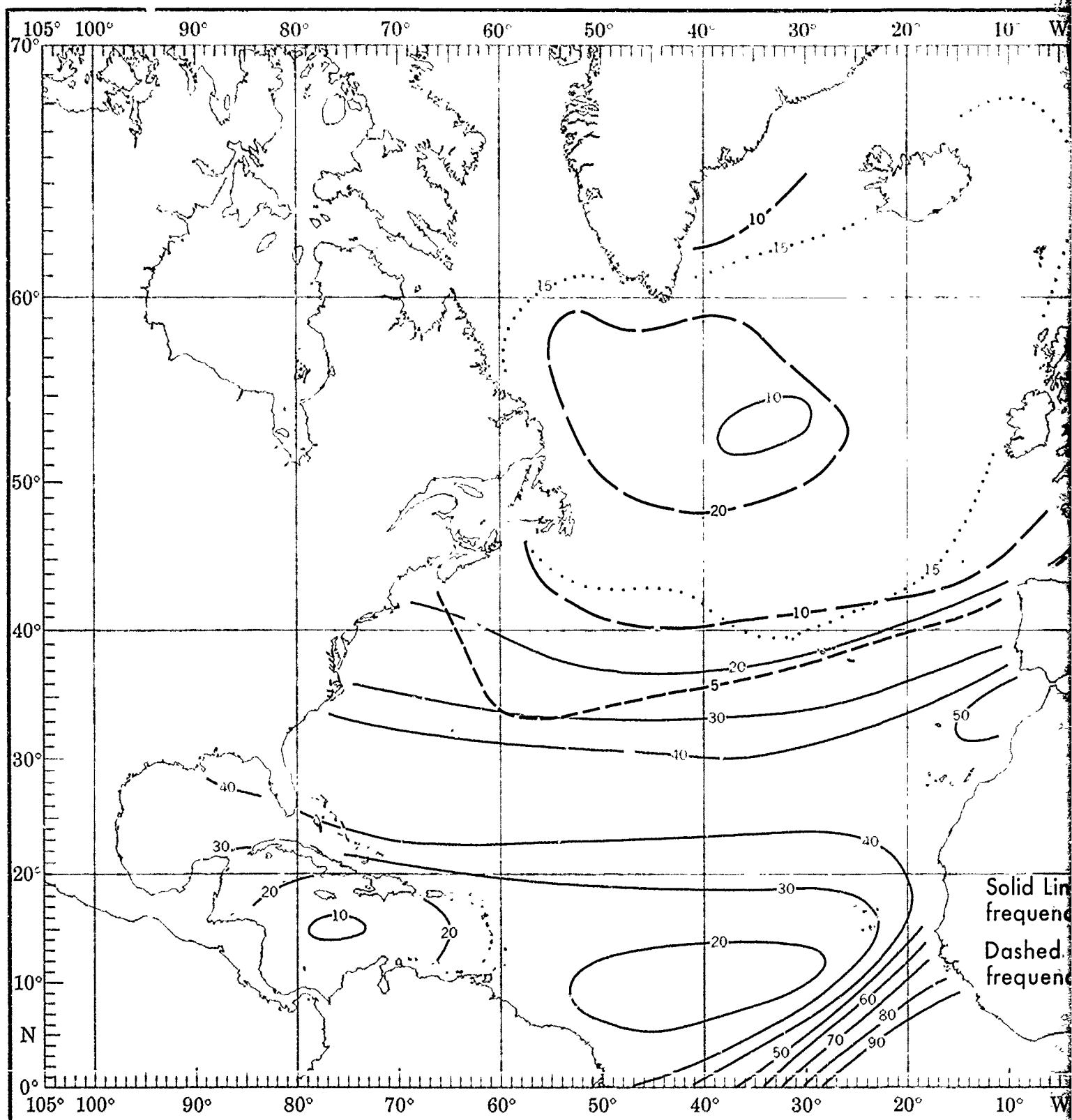
# DS FOR TABLES

ALL DAYS

SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

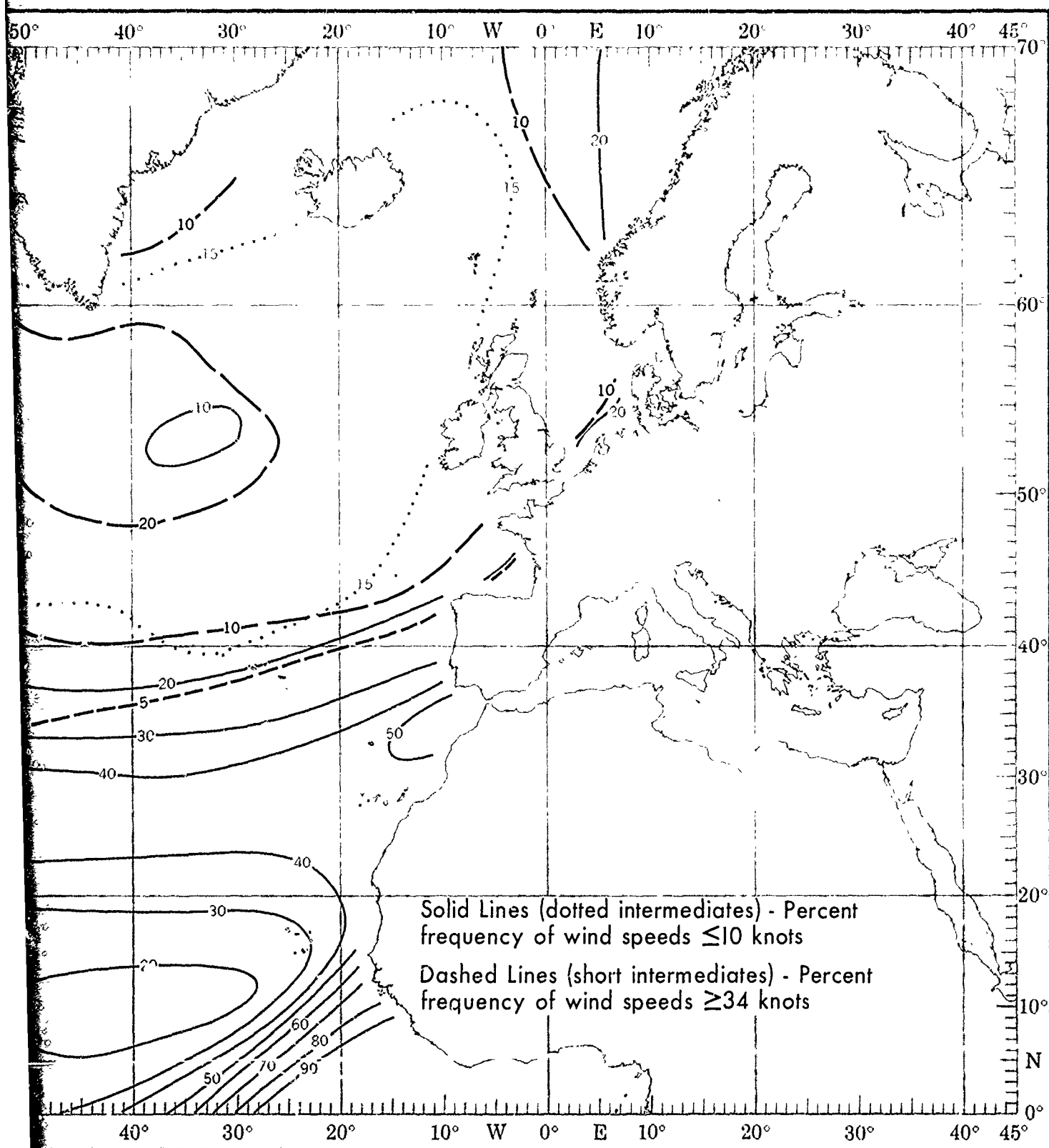
WAVE HEIGHT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230	1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247	1248	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	1281	1282	1283	1284	1285	1286	1287	1288	1289	1290	1291	1292	1293	1294	1295	1296	1297	1298	1299	1300	1301	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332	1333	1334	1335	1336	1337	1338	1339	1340	1341	1342	1343	1344	1345	1346	1347	1348	1349	1350	1351	1352	1353	1354	1355	1356	1357	1358	1359	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374	1375	1376	1377	1378	1379	1380	1381	1382	1383	1384	1385	1386	1387	1388	1389	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399	1400	1401	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418	1419	1420	1421	1422	1423	1424	1425	1426	1427	1428	1429	1430	1431	1432	1433	1434	1435	1436	1437	1438	1439	1440	1441	1442	1443	1444	1445	1446	1447	1448	1449	1450	1451	1452	1453	1454	1455	1456	1457	1458	1459	1460	1461	1462	1463	1464	1465	1466	1467	1468	1469	1470	1471	1472	1473	1474	1475	1476	1477	1478	1479	1480
-------------	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)



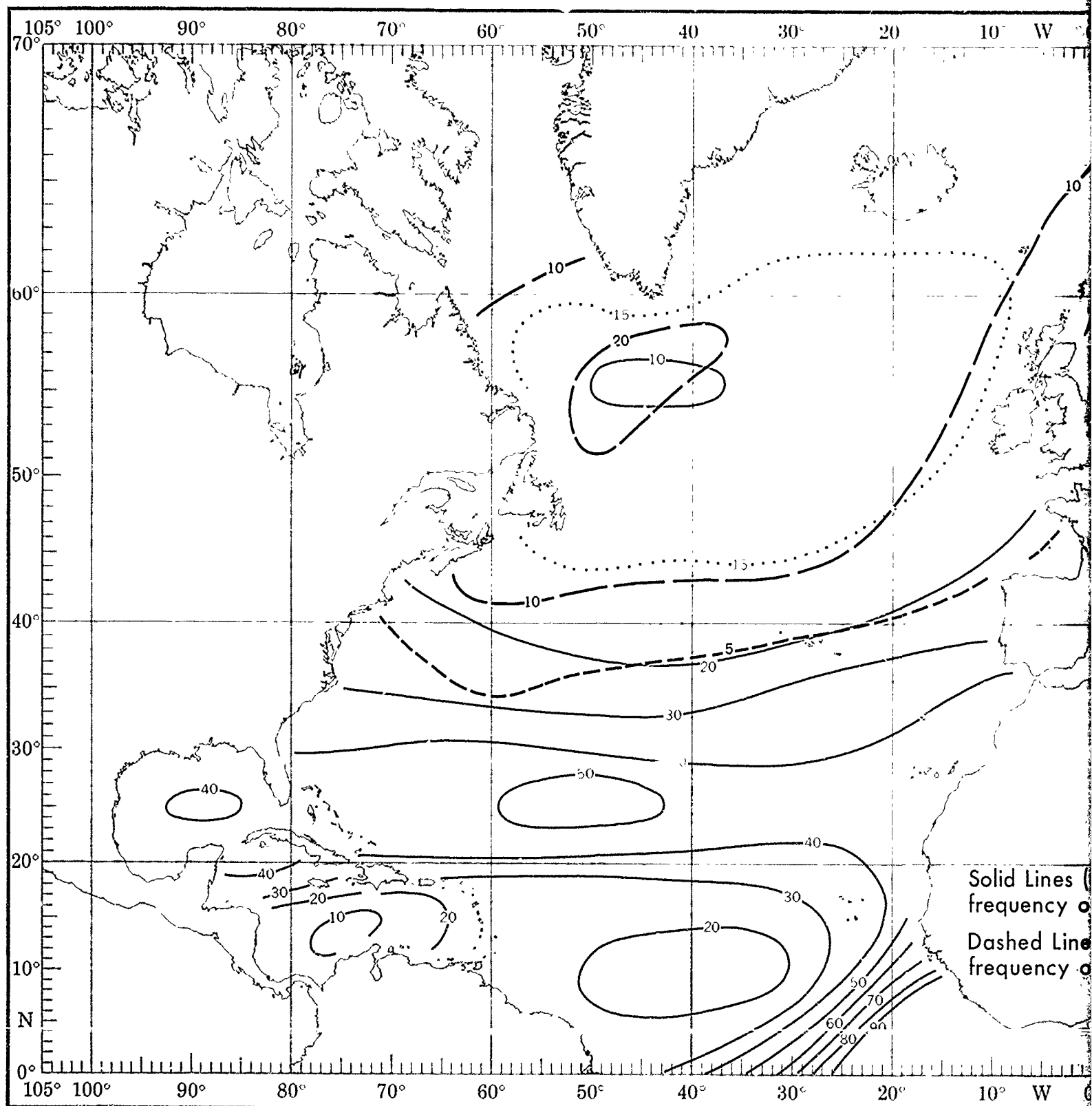
TS)

JANUARY



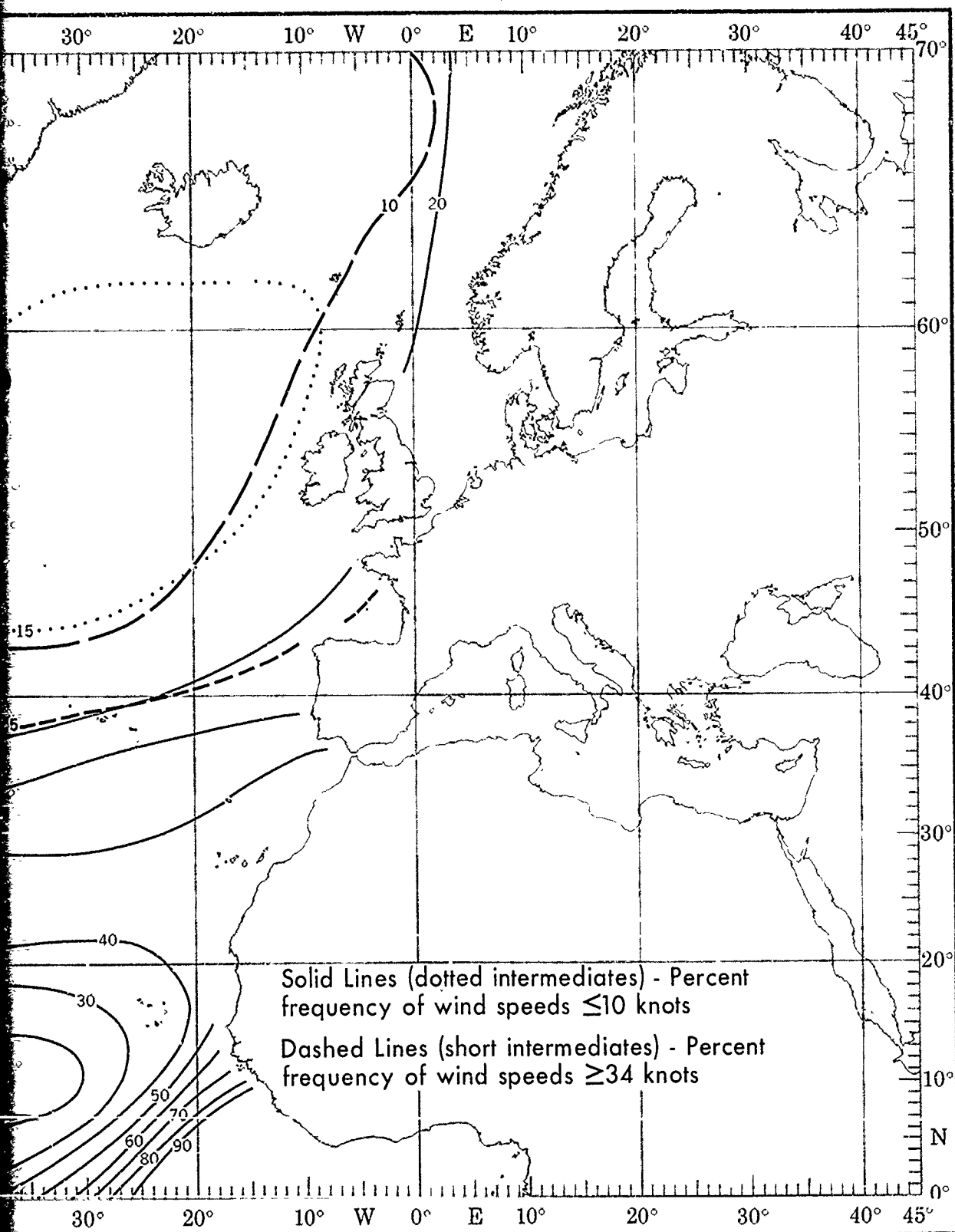
# FEBRUARY

# WIND S

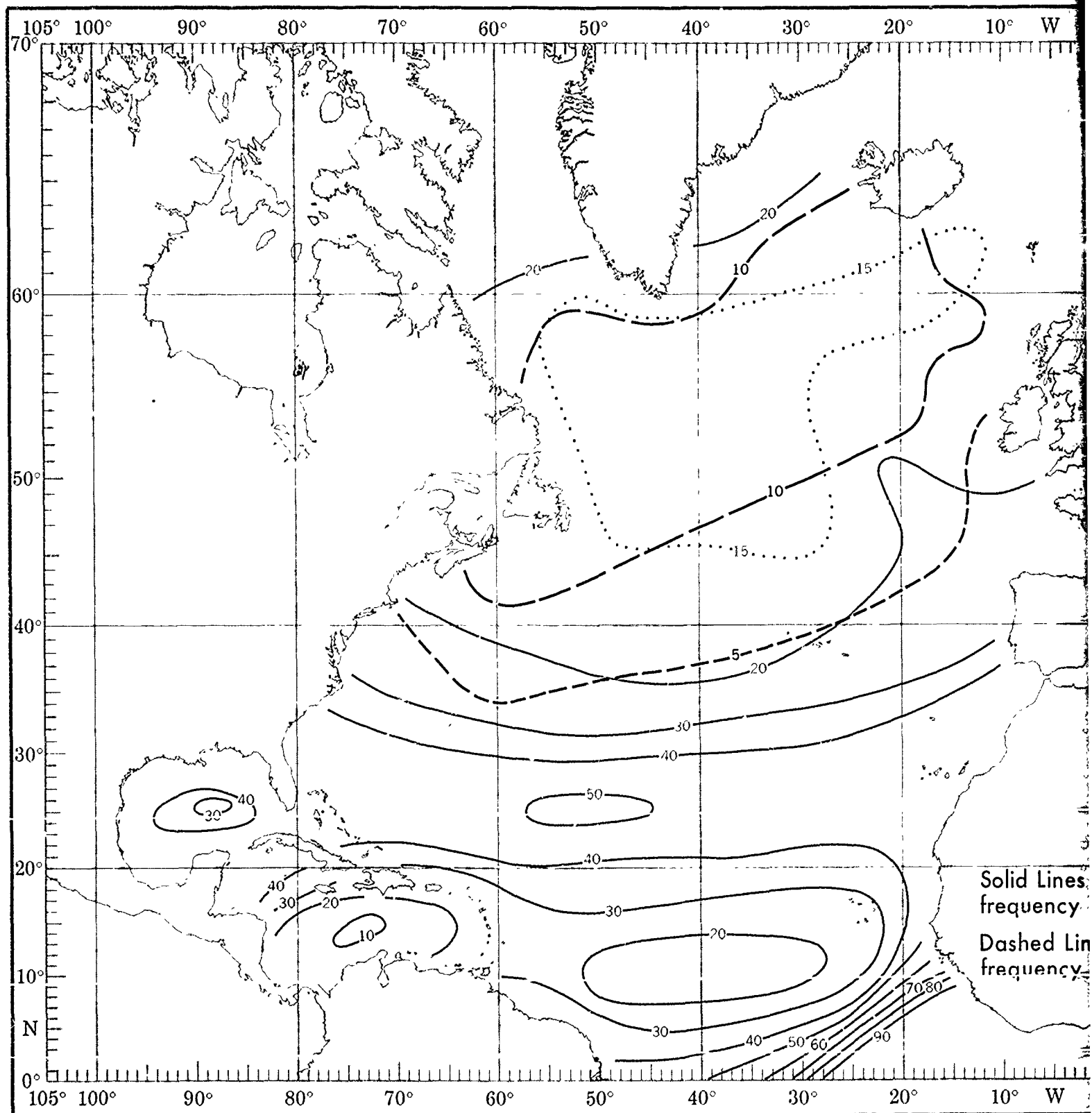




# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)

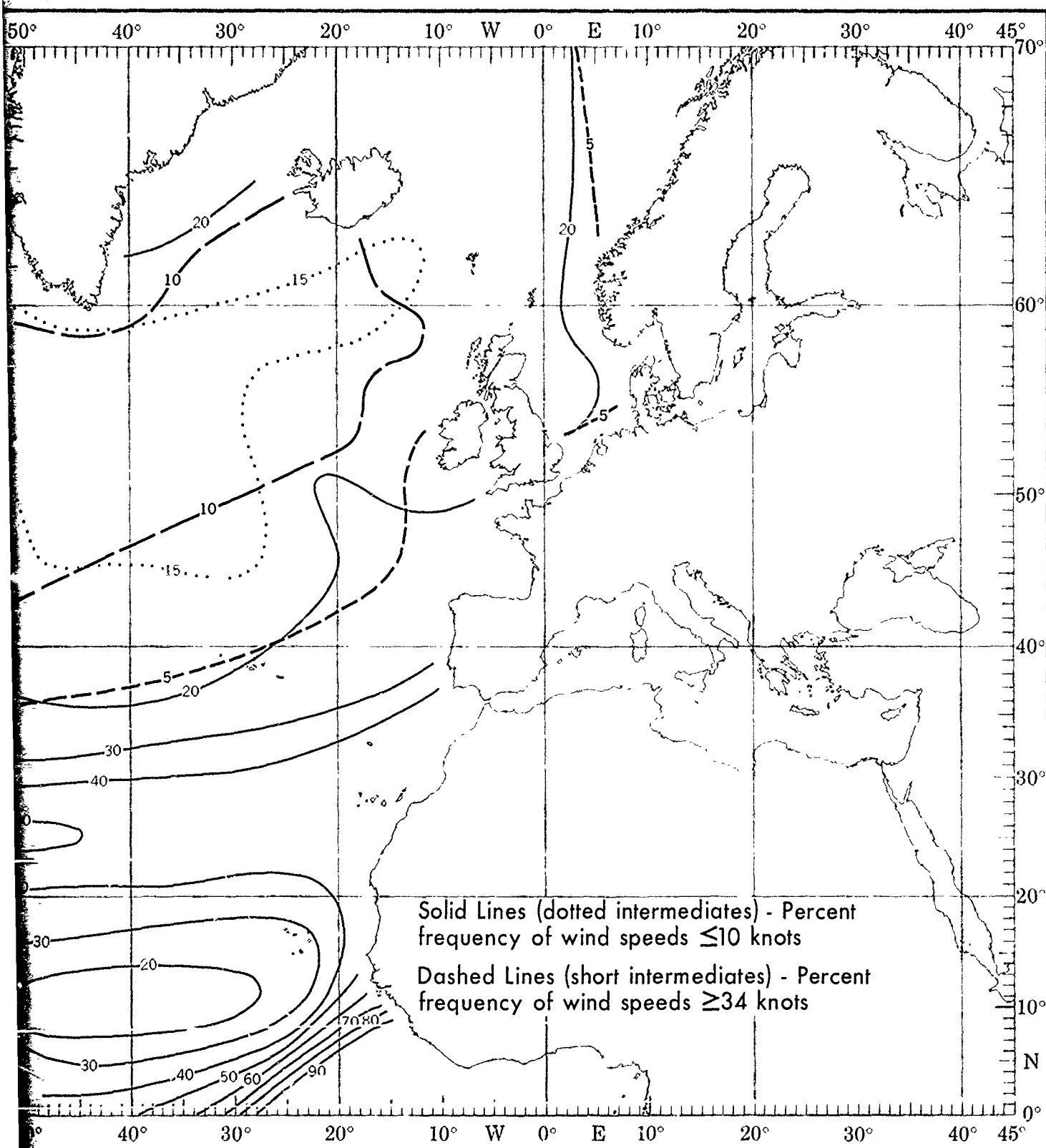


# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)



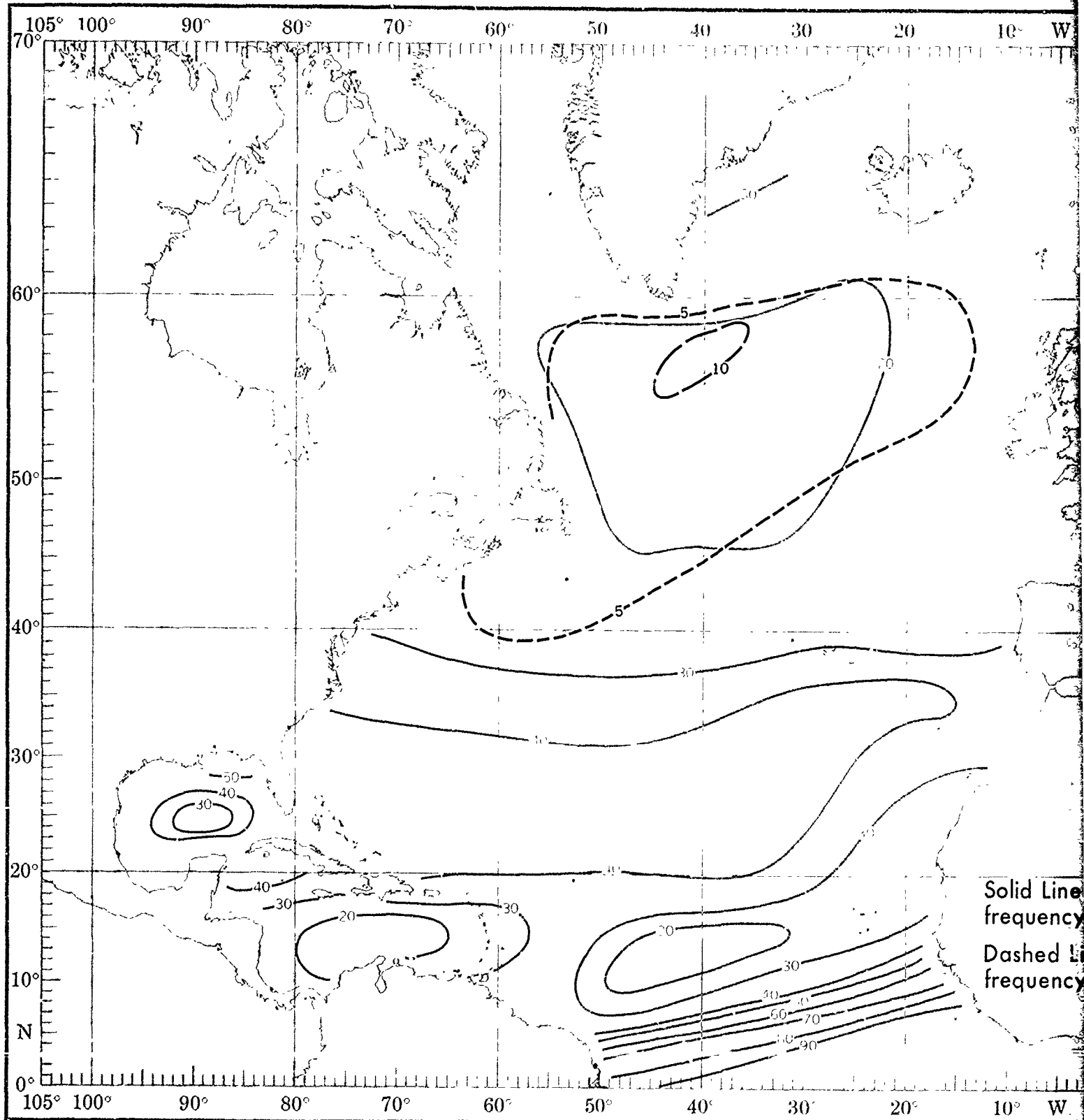
TS)

MARCH

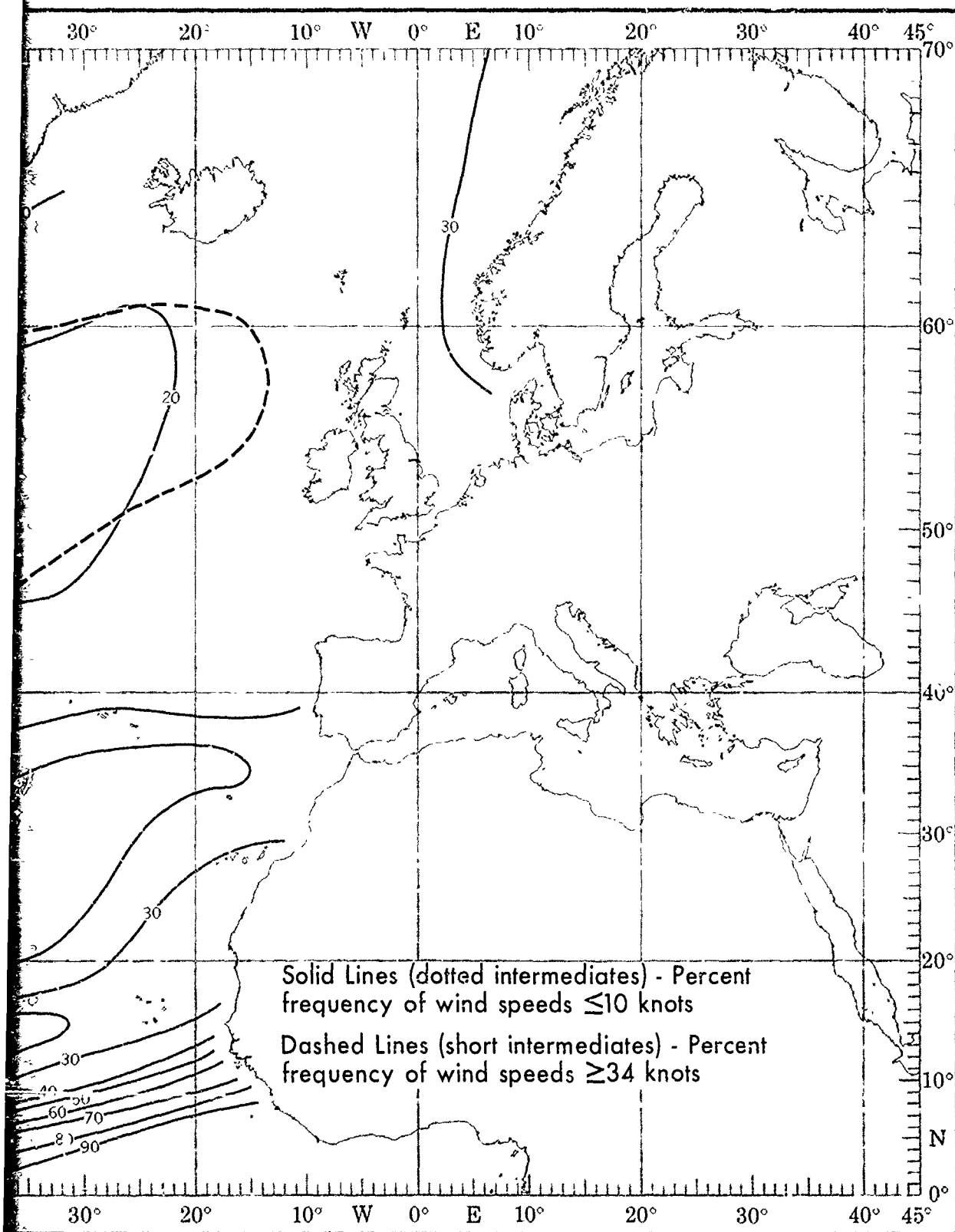


APRIL

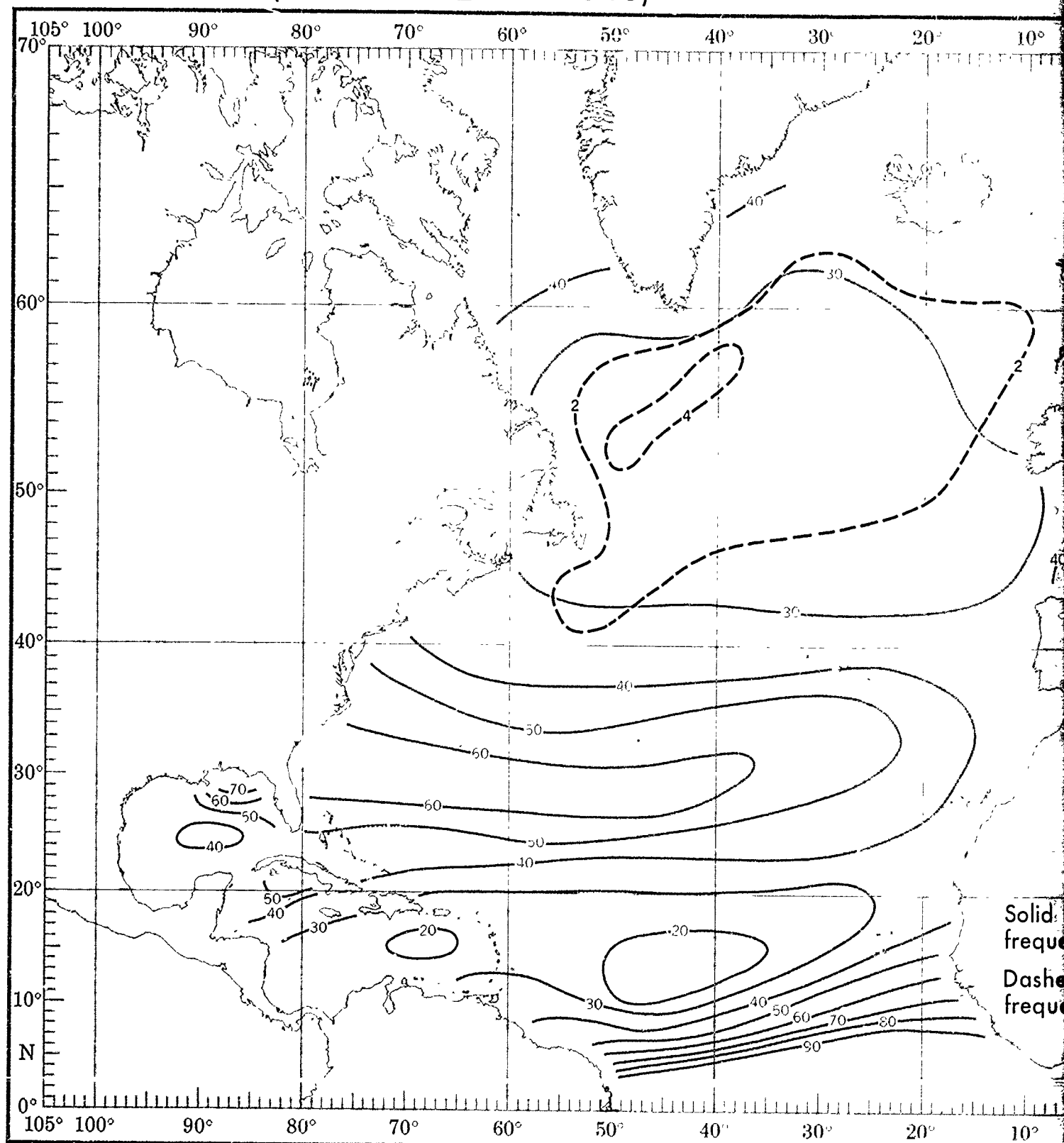
WIND



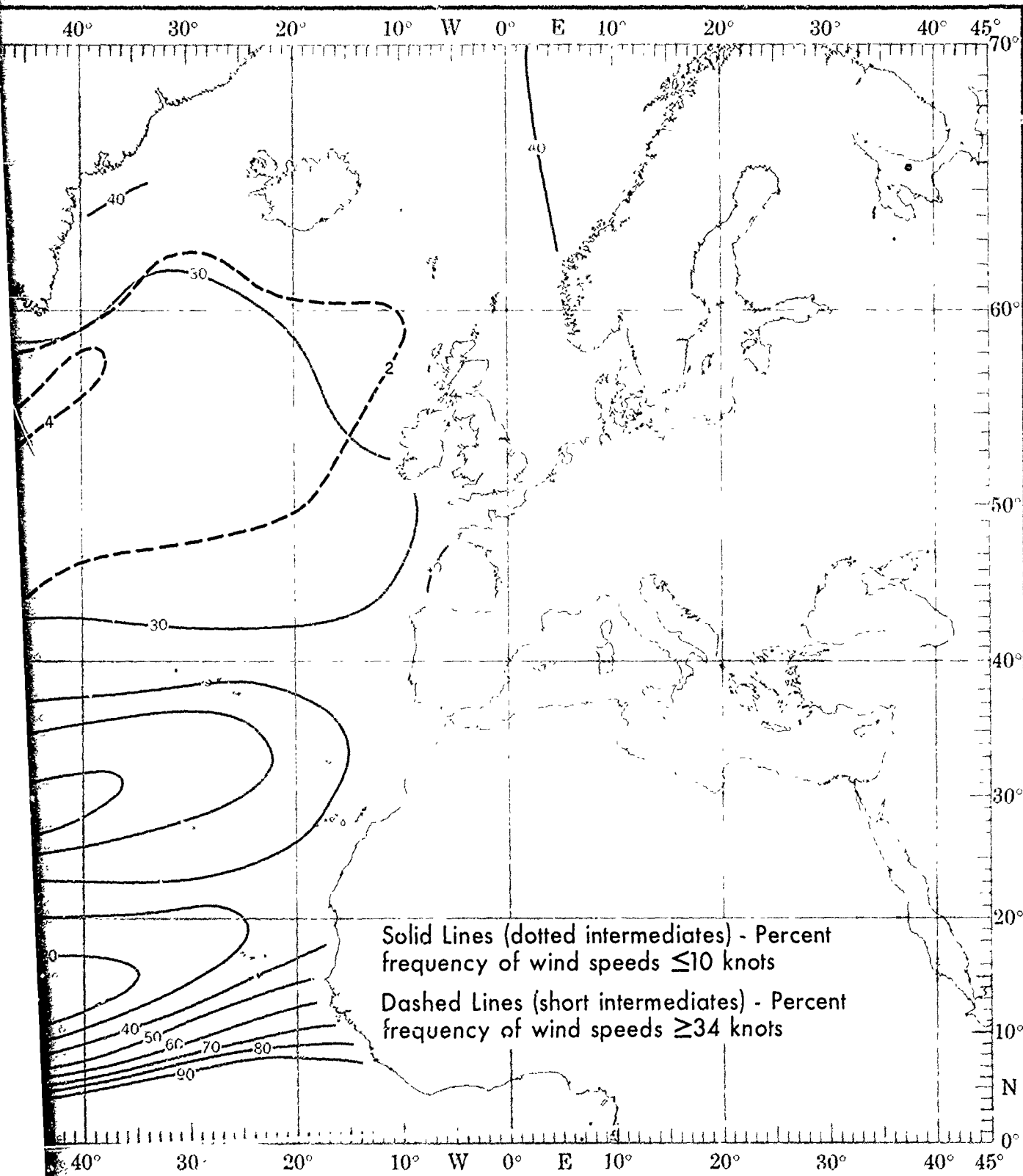
# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)



# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)

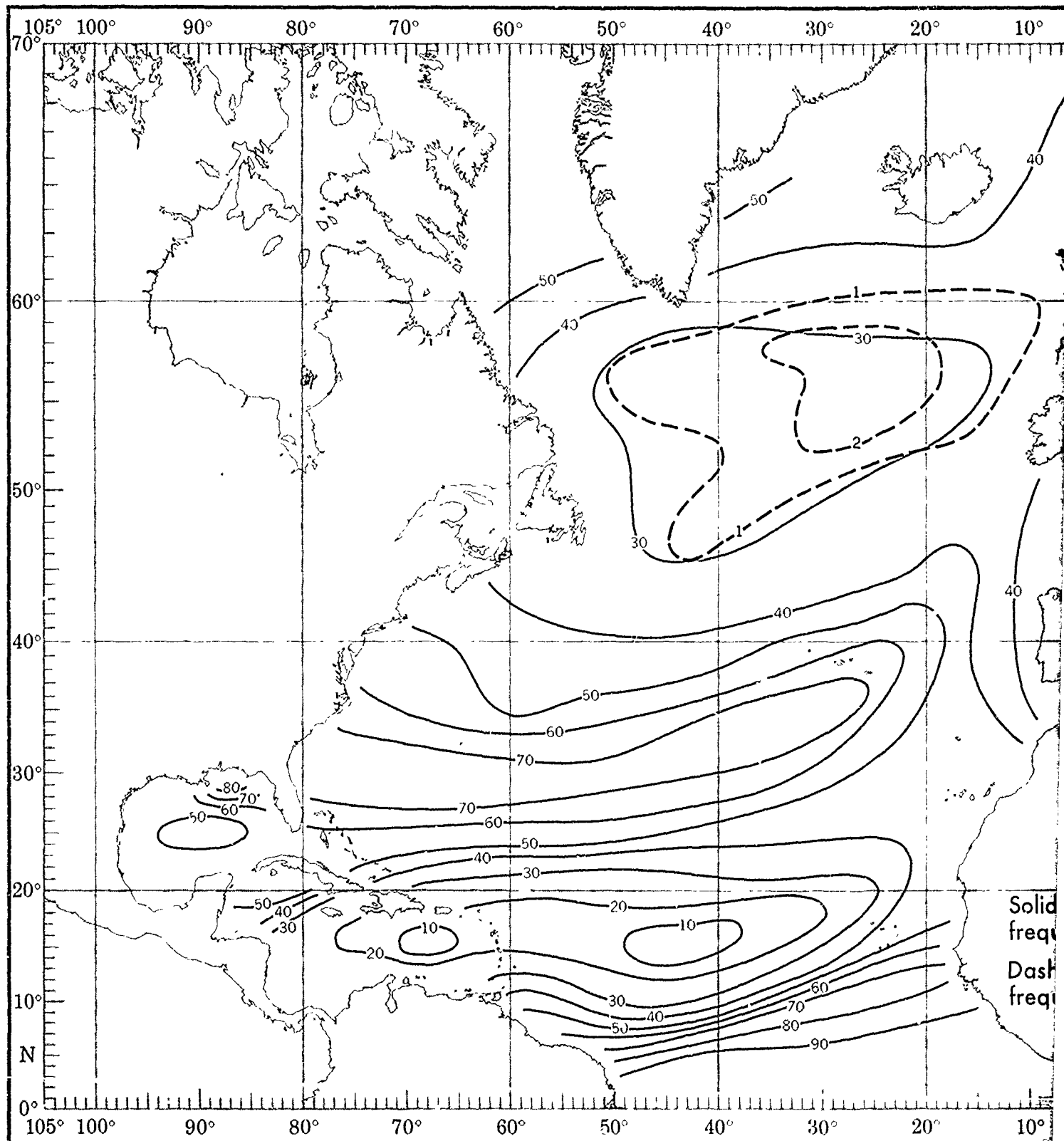


MAY



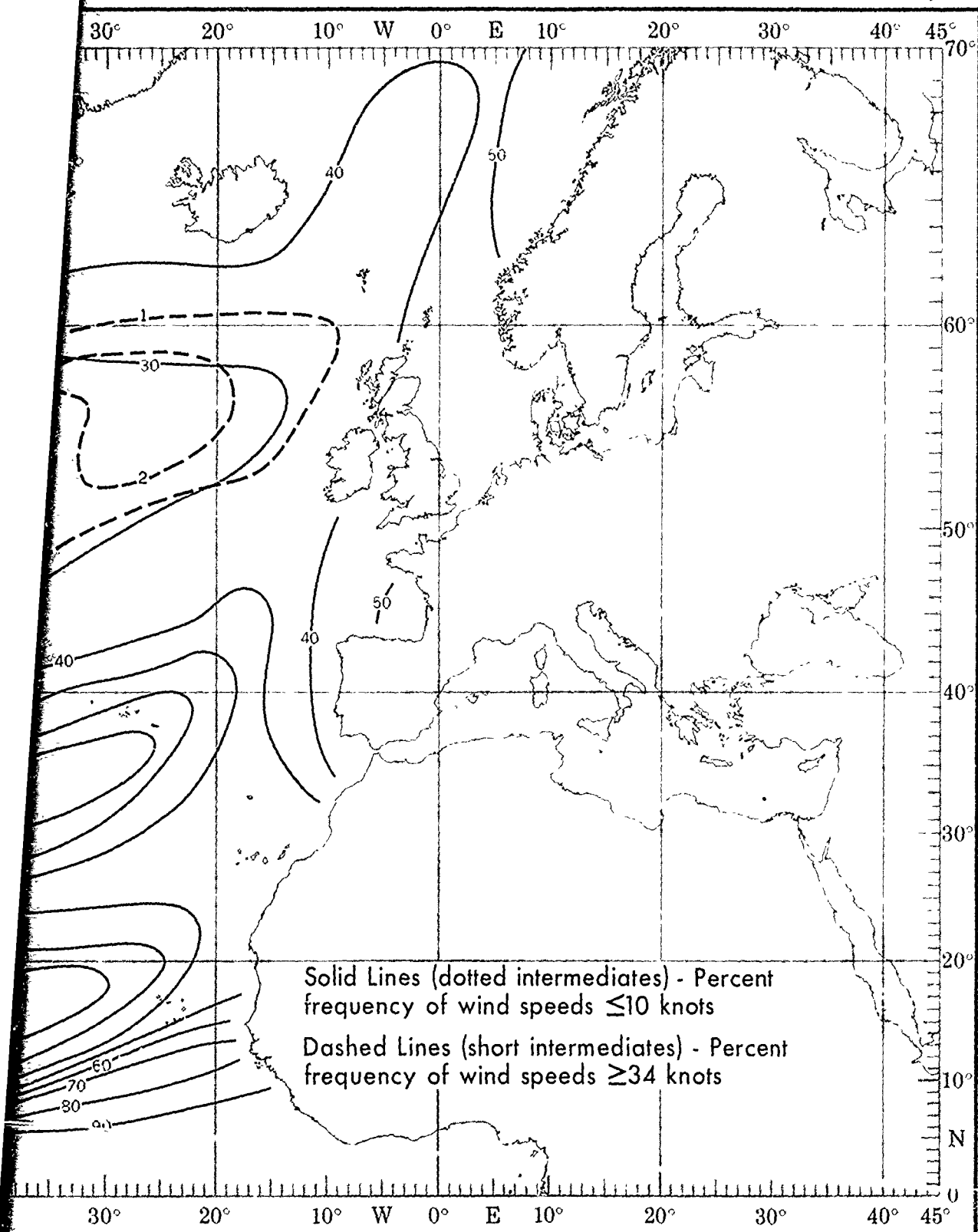
JUNE

WIN

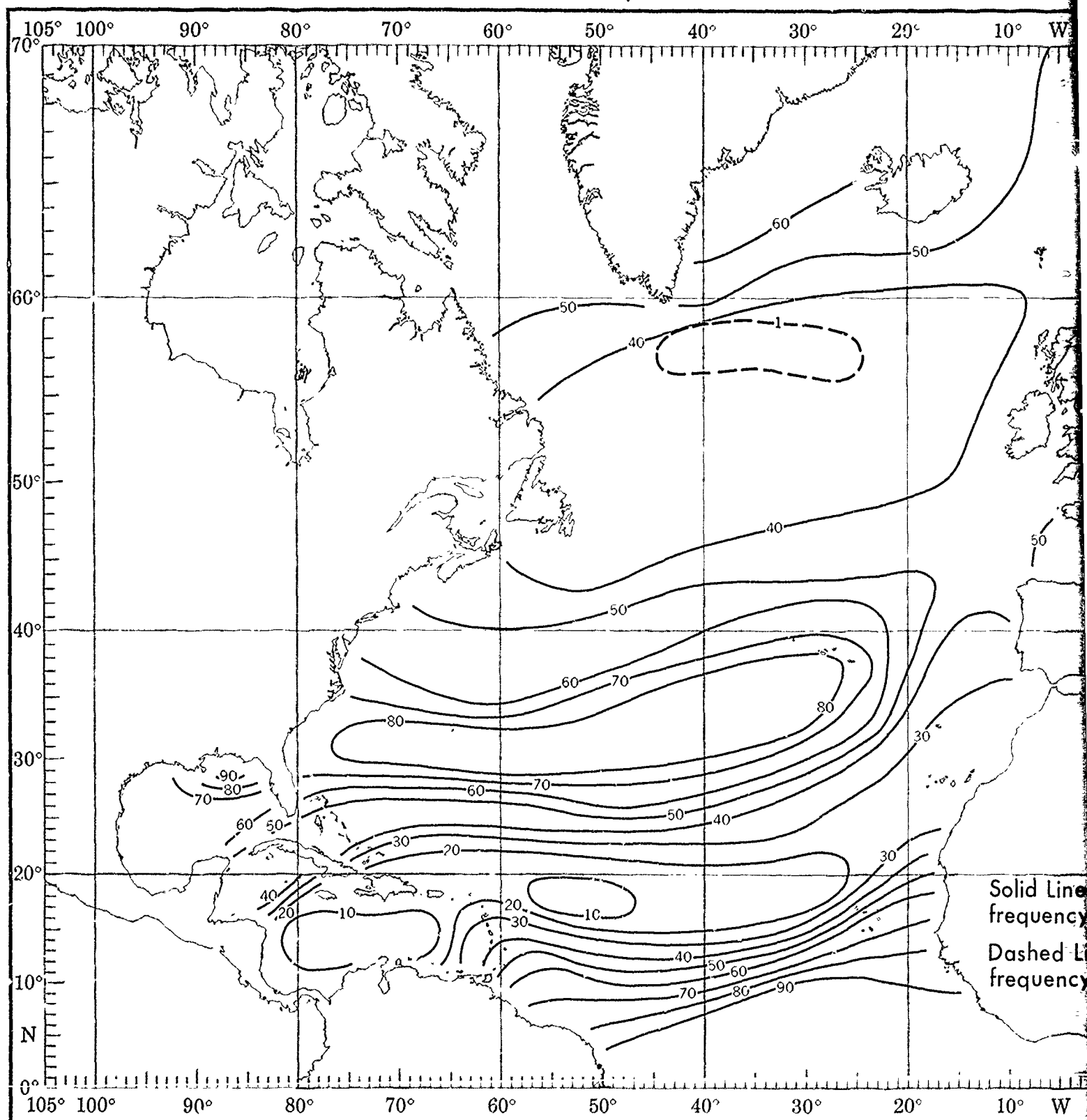




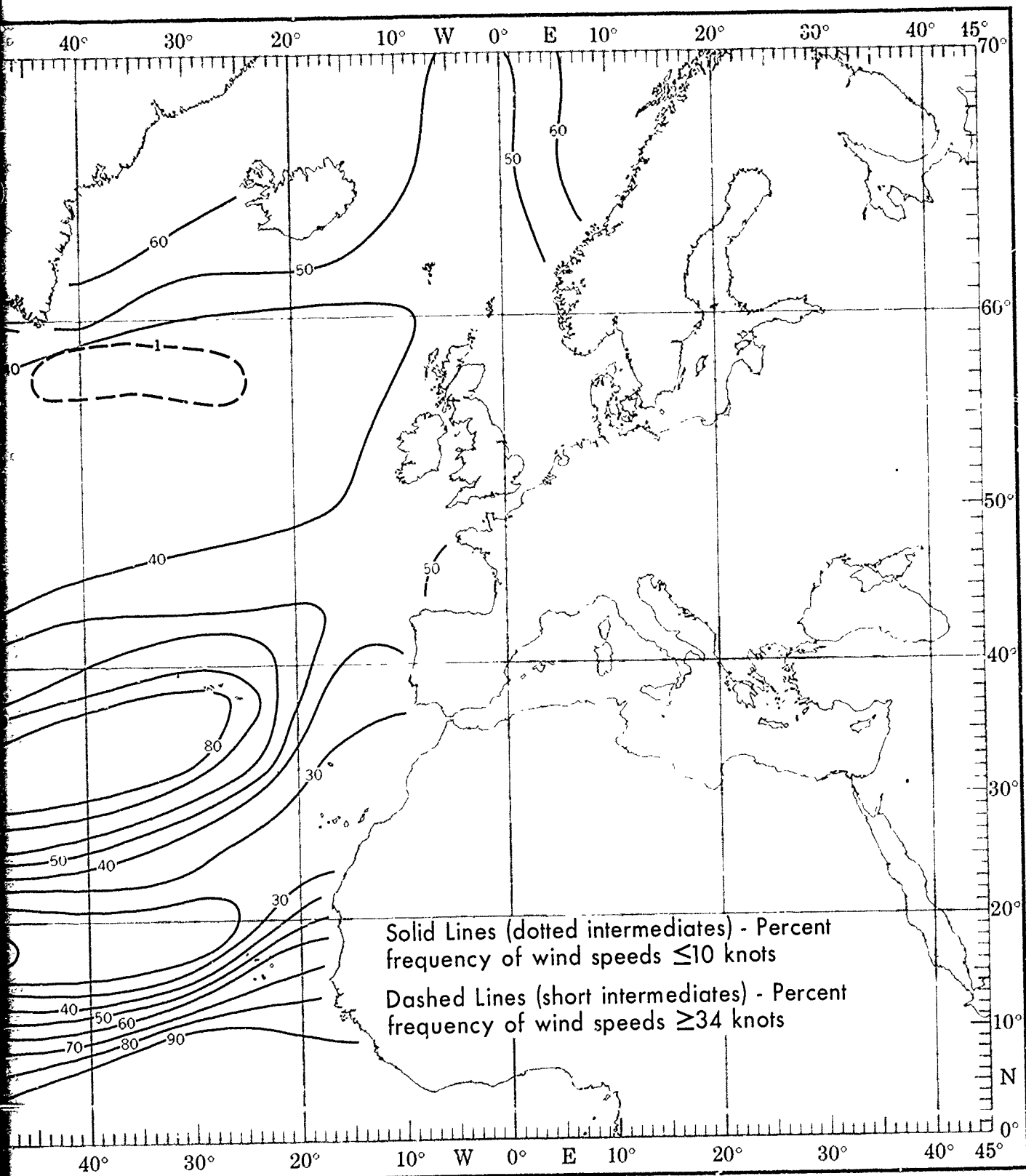
# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)



# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)

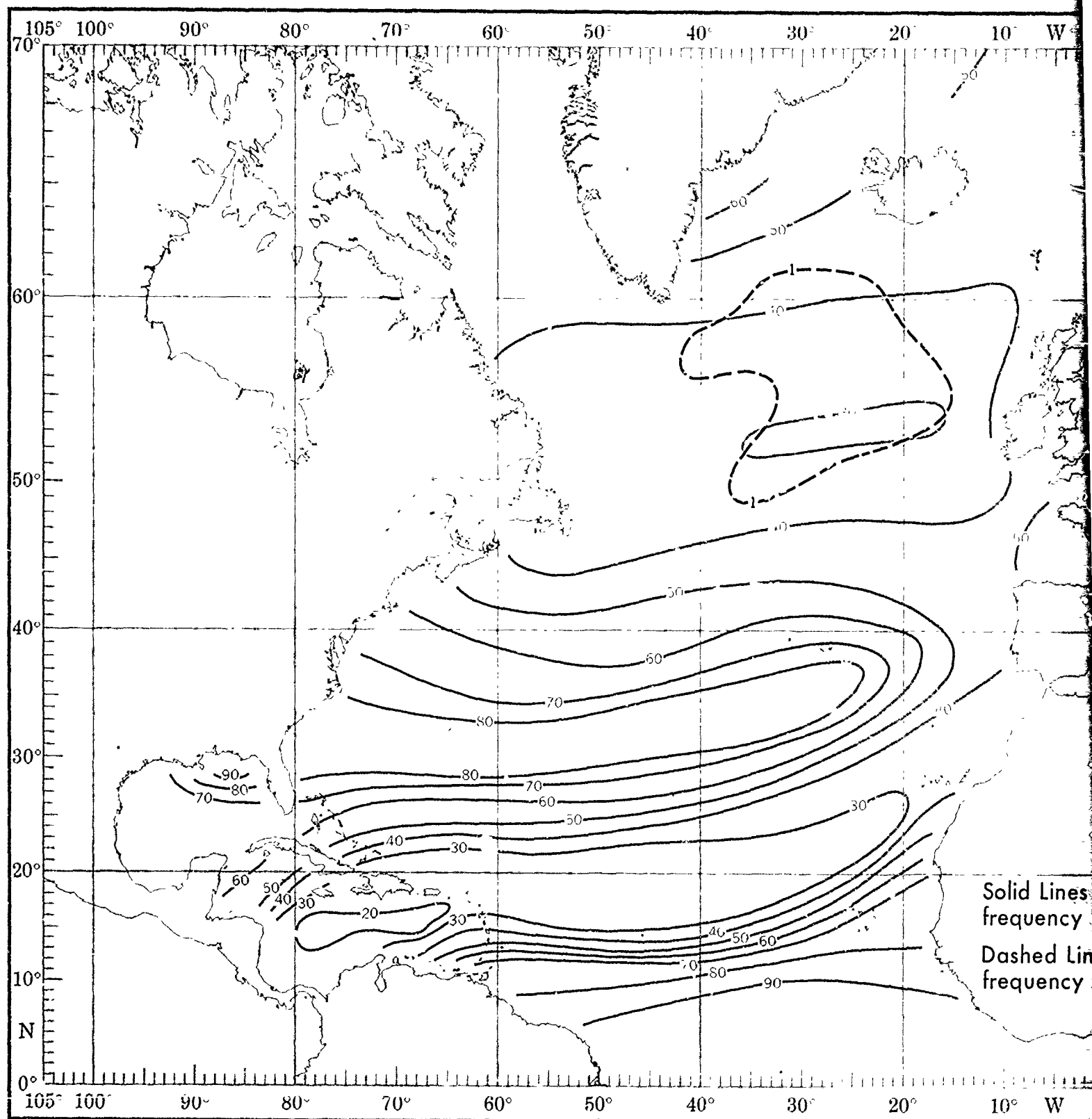


# JULY

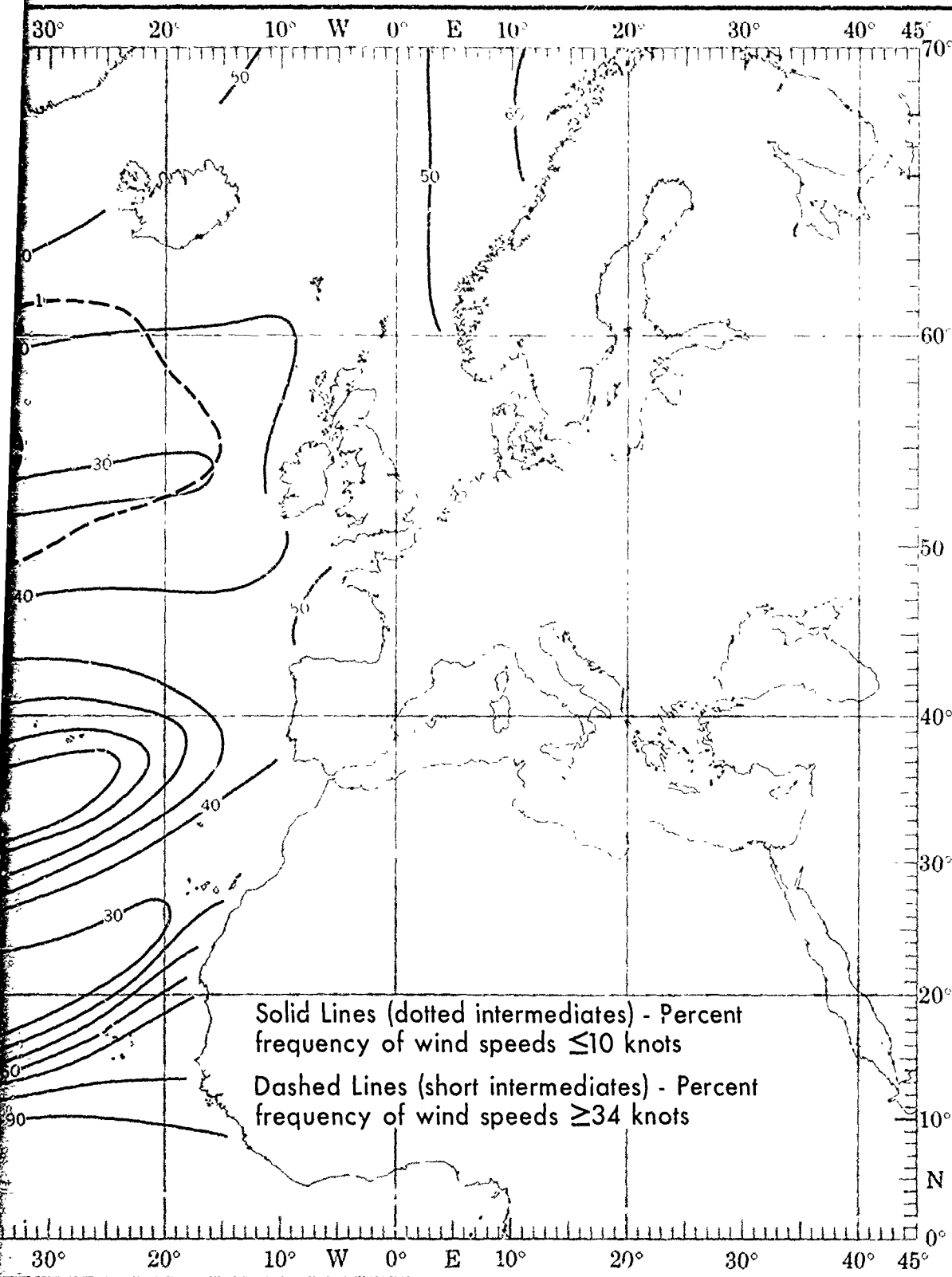


AUGUST

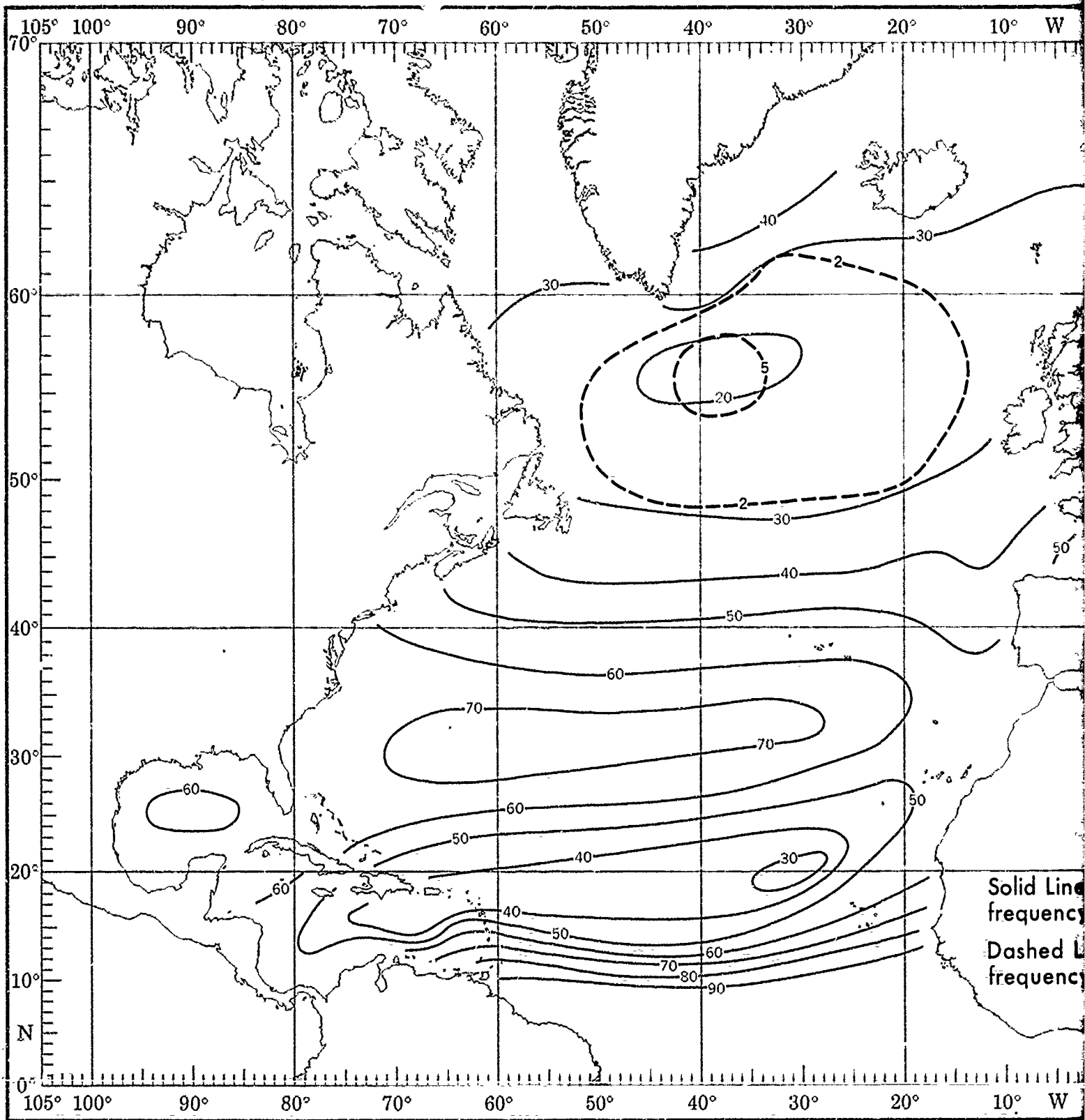
WIND



# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)

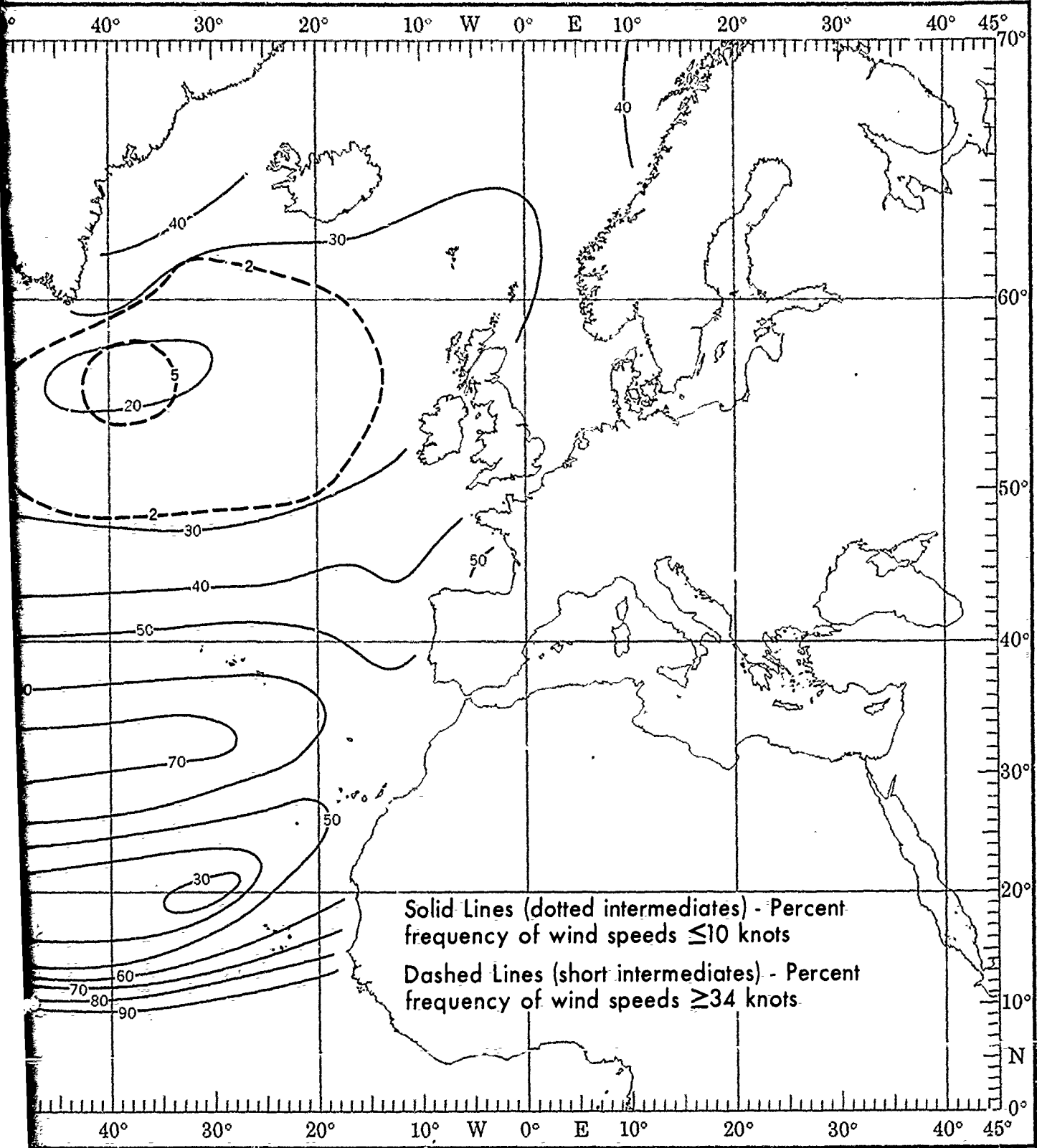


# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)



S)

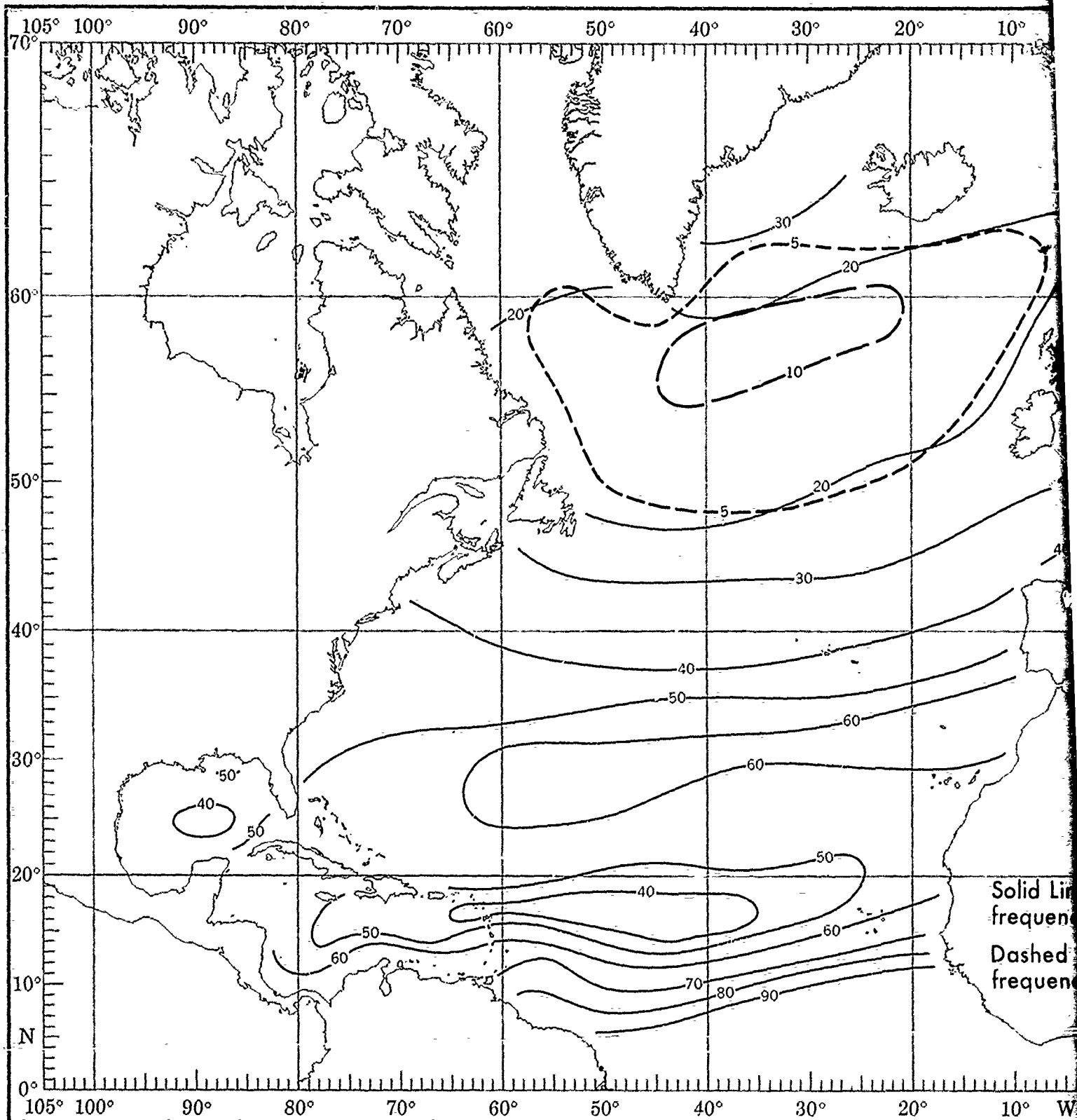
SEPTEMBER



Solid Lines (dotted intermediates) - Percent frequency of wind speeds  $\leq 10$  knots  
Dashed Lines (short intermediates) - Percent frequency of wind speeds  $\geq 34$  knots

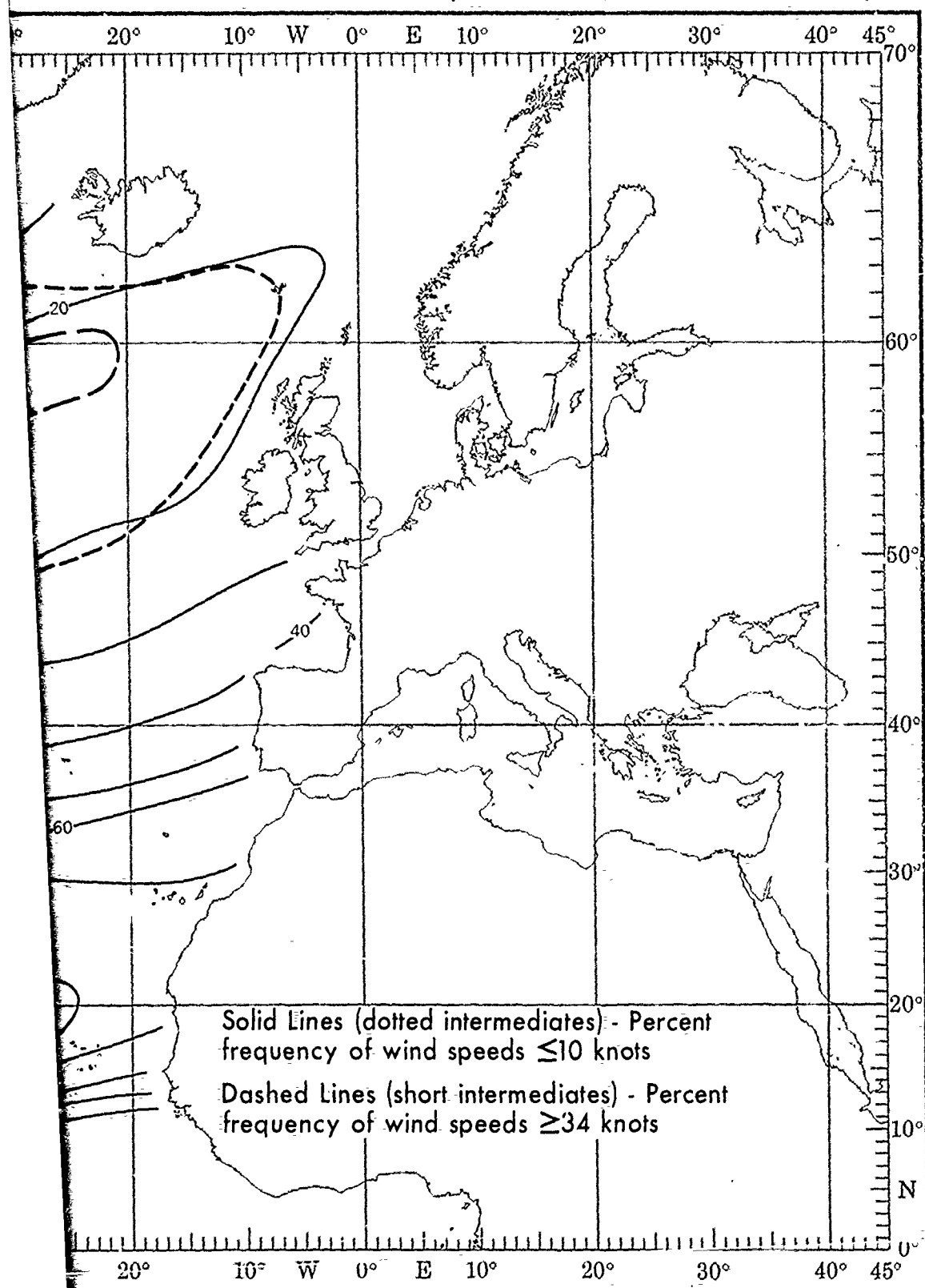
OCTOBER

WIN

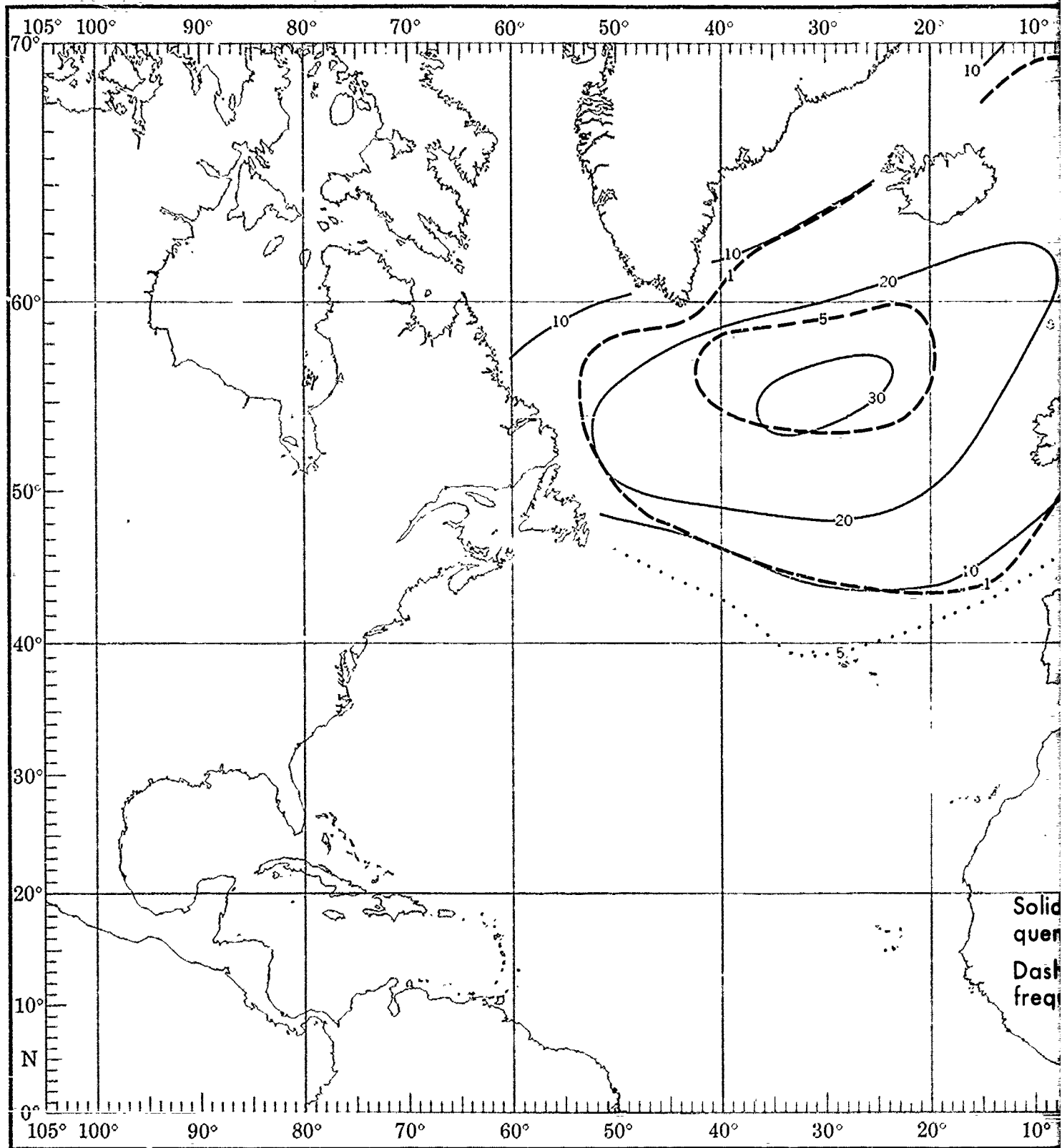




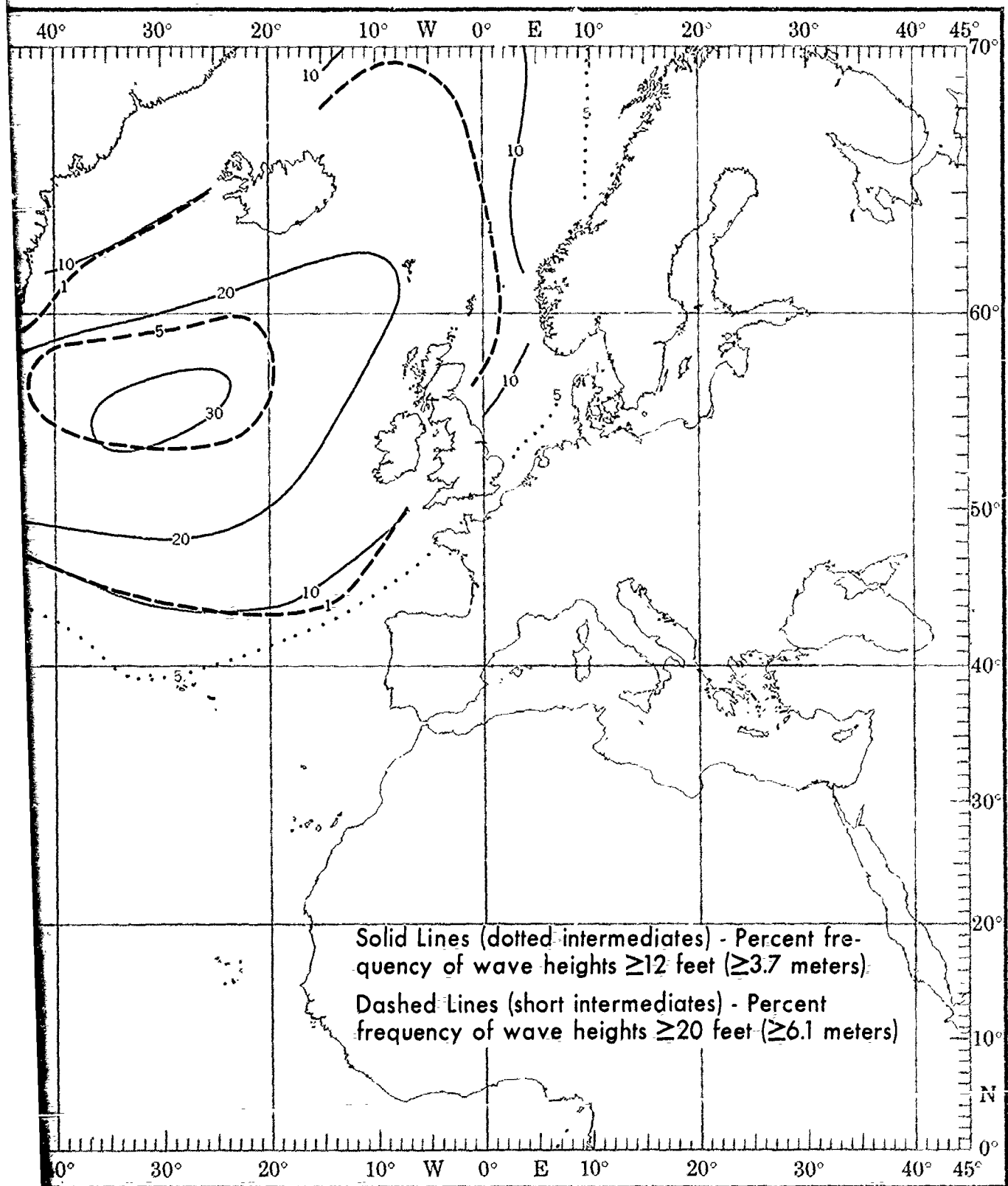
# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)



# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)

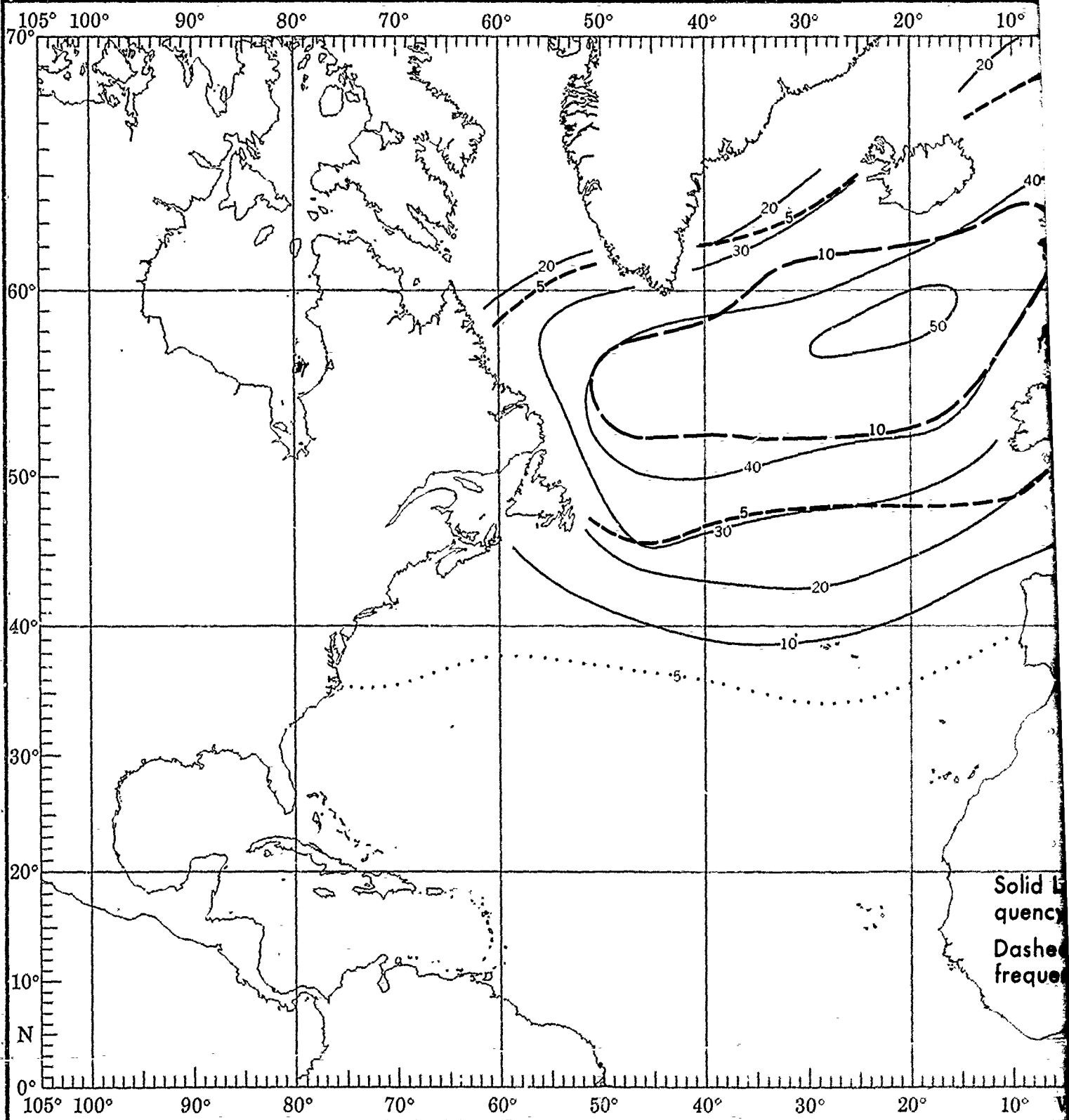


# SEPTEMBER

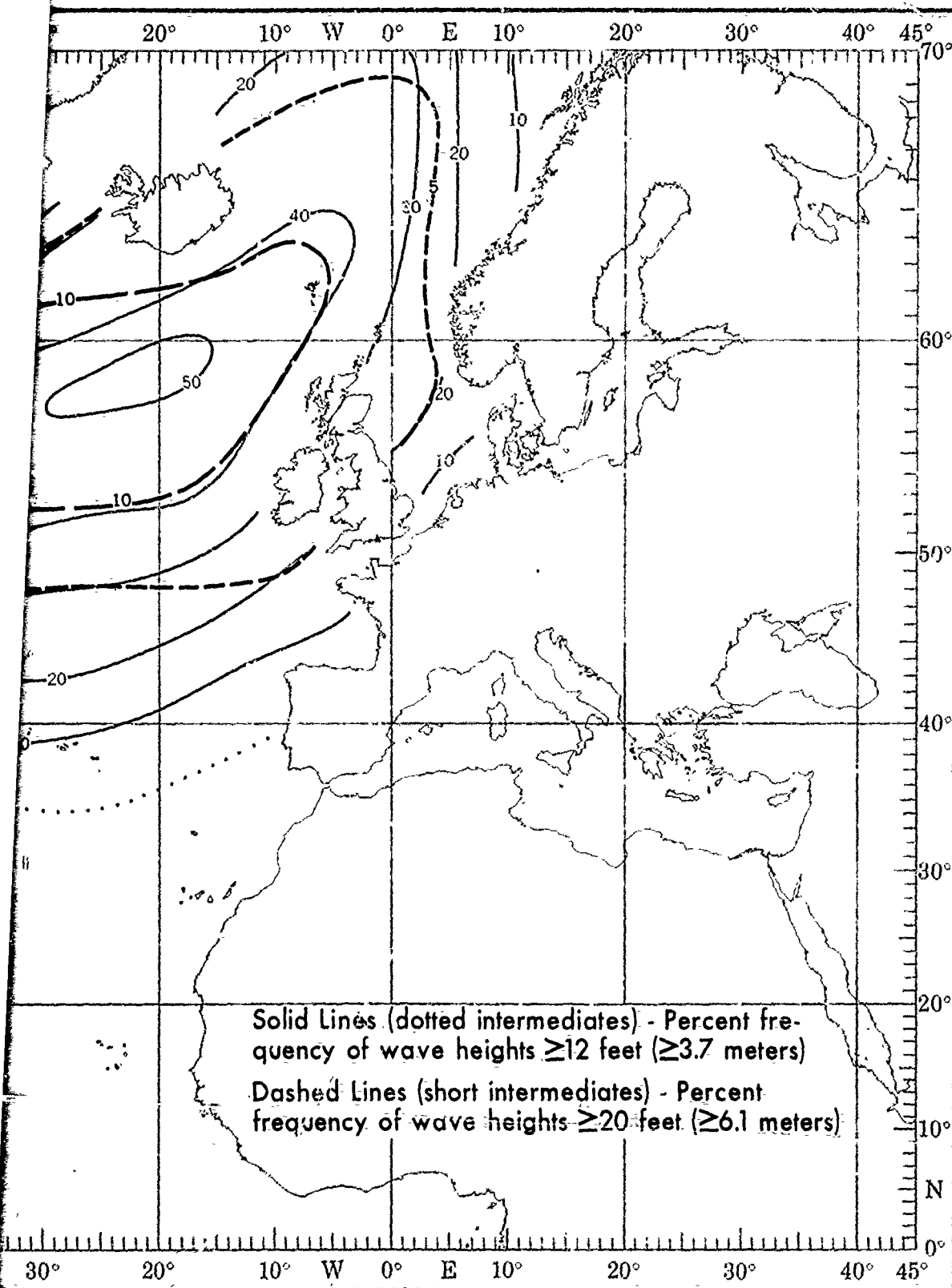


OCTOBER

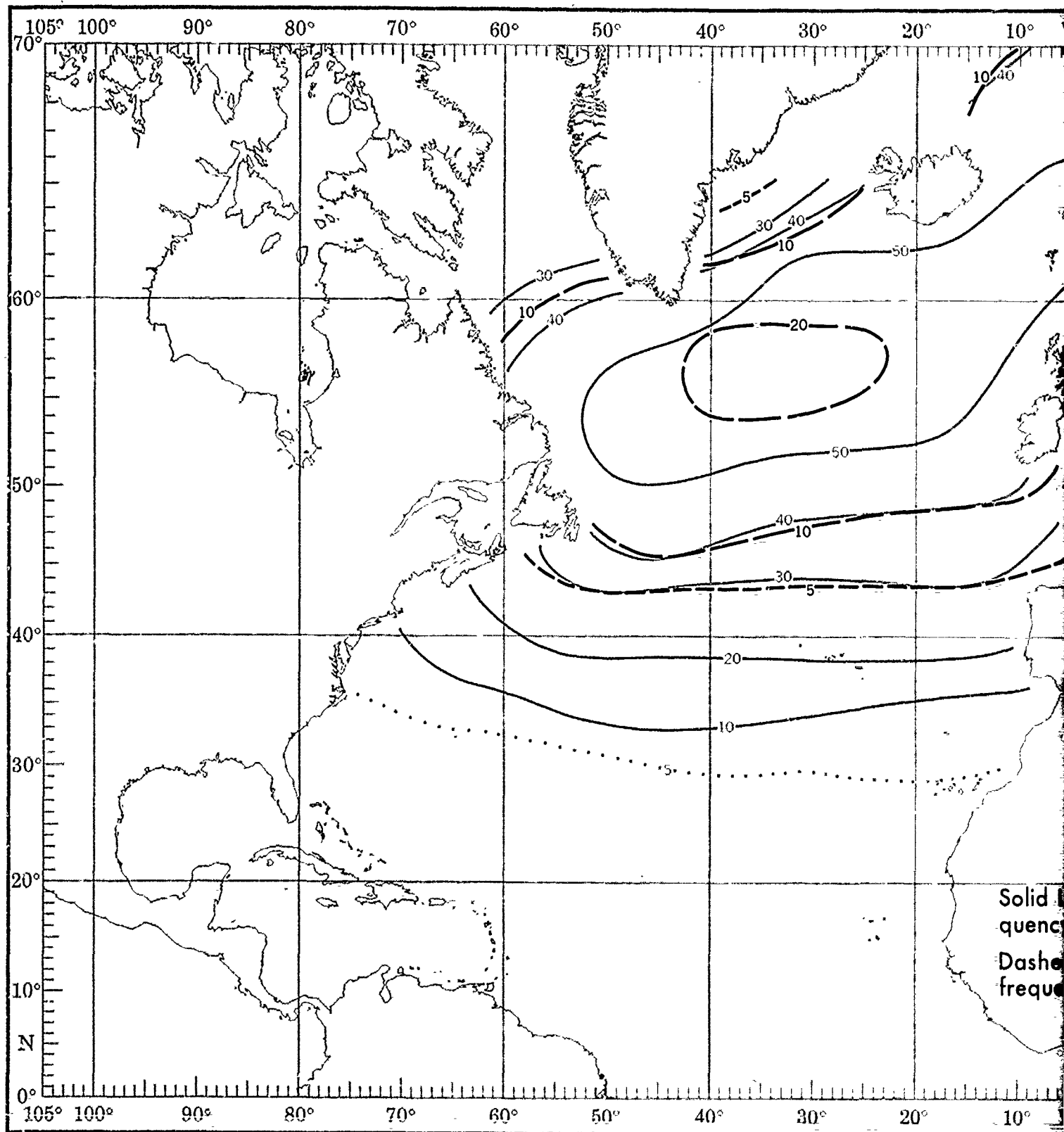
W



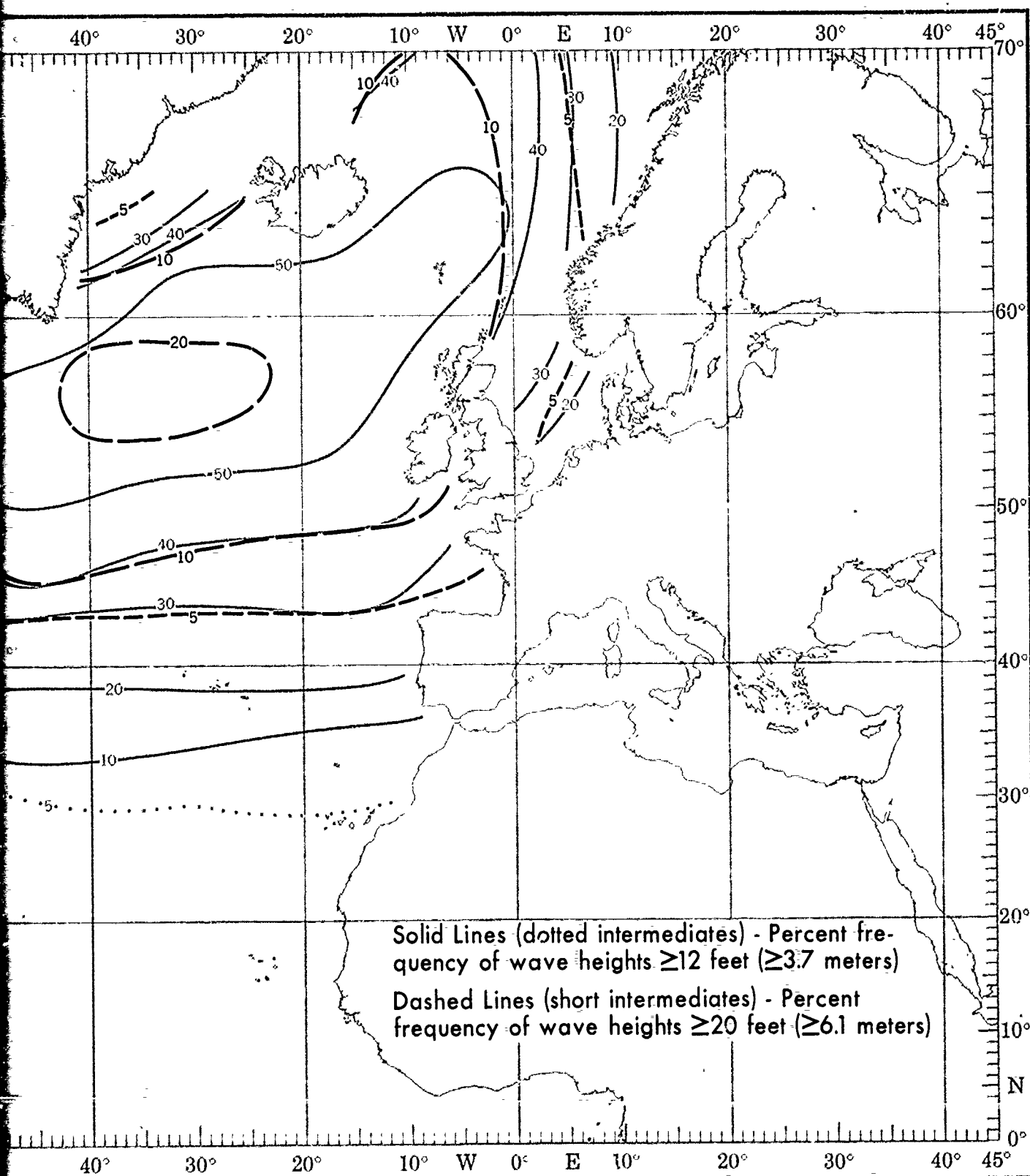
# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)



# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)

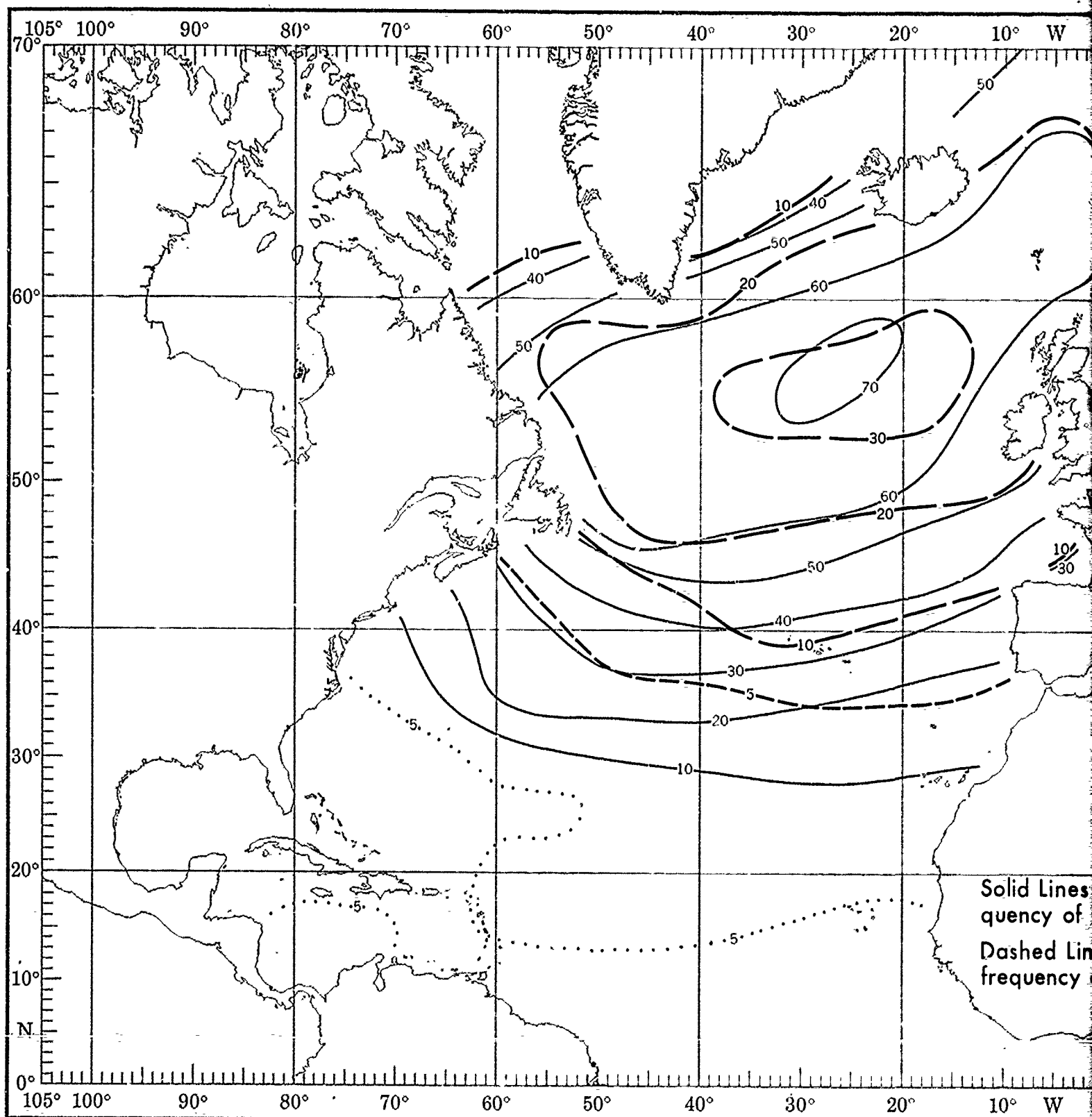


# NOVEMBER



# DECEMBER

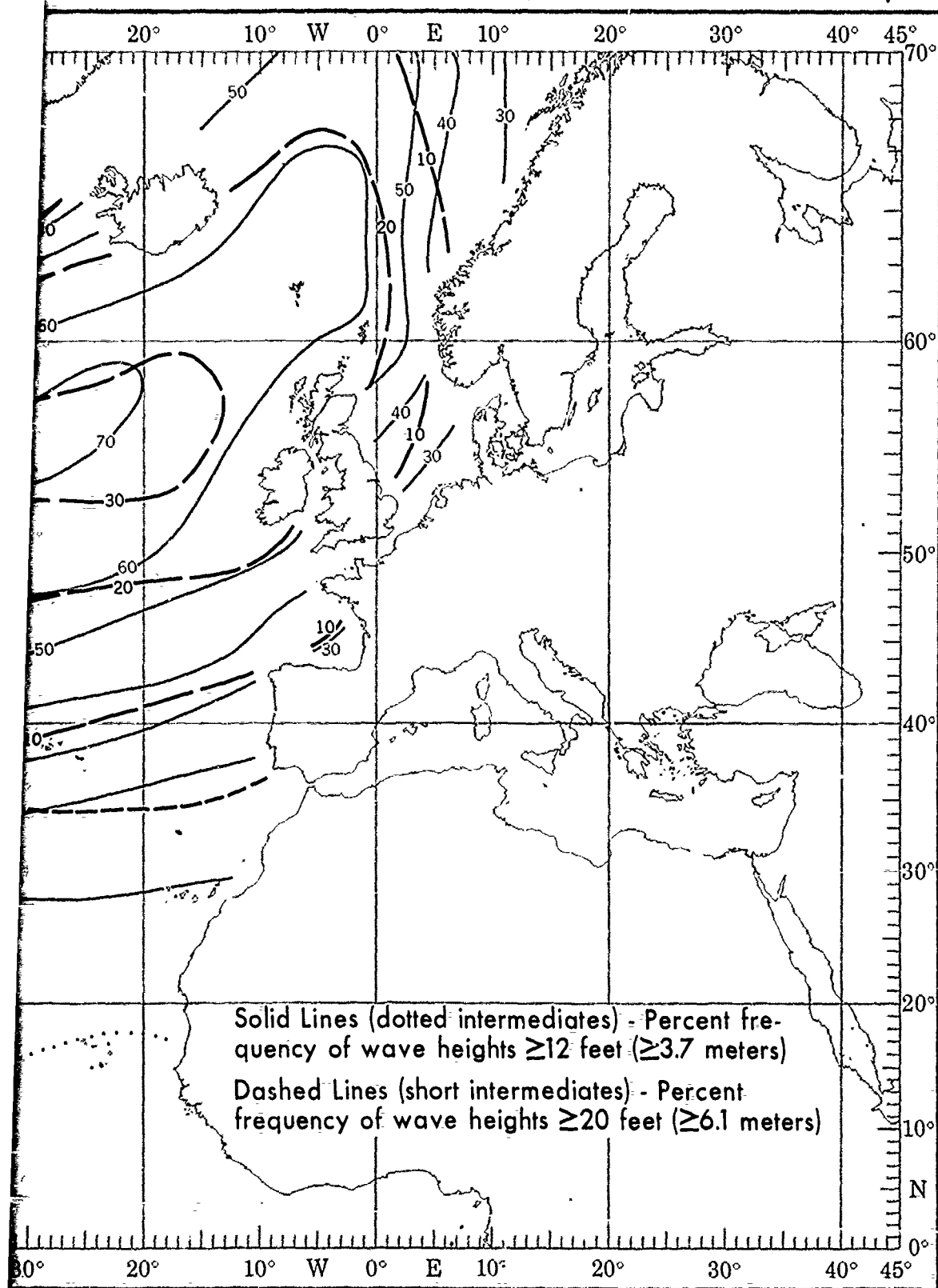
# WAVE



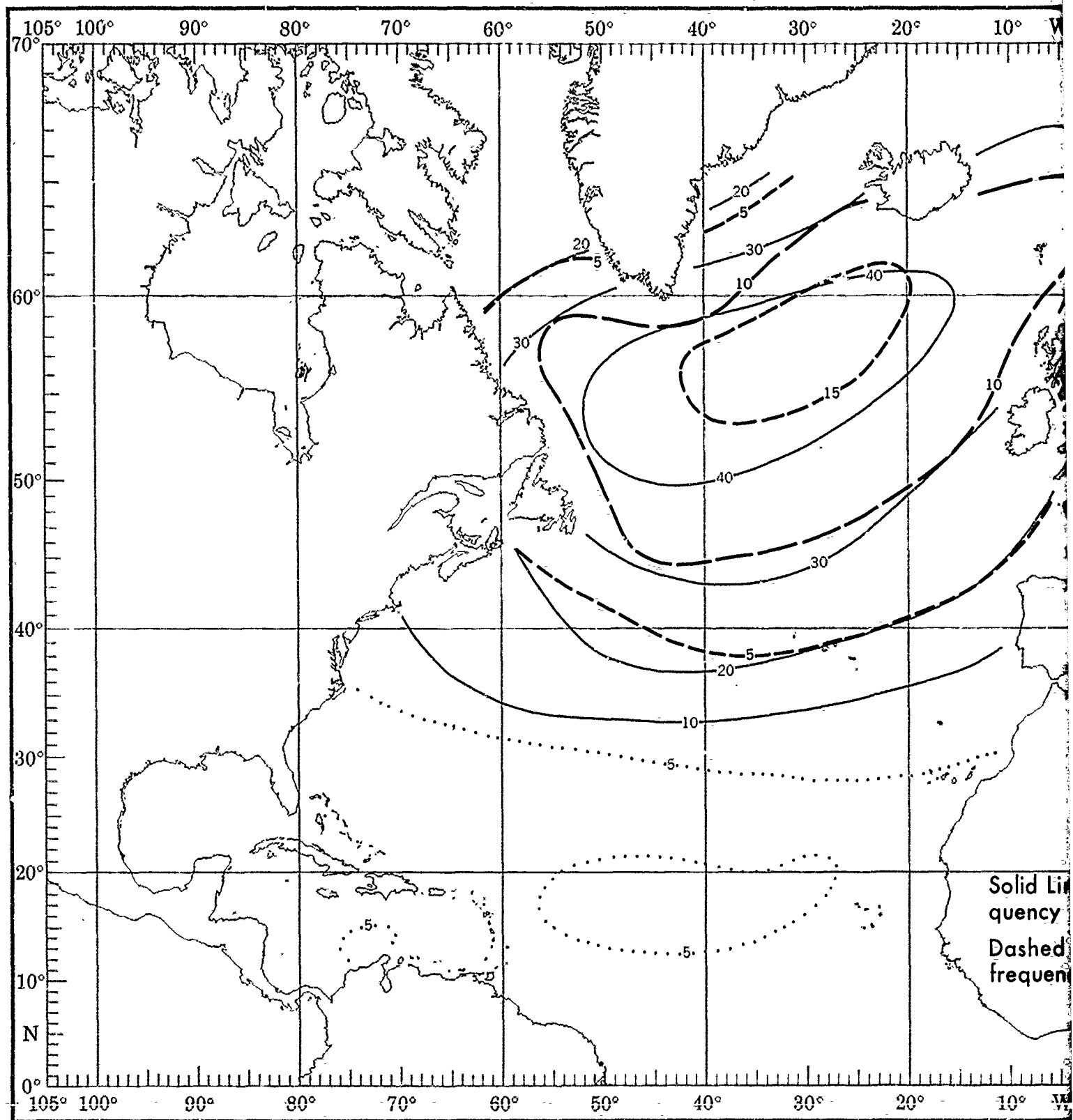
①



# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)

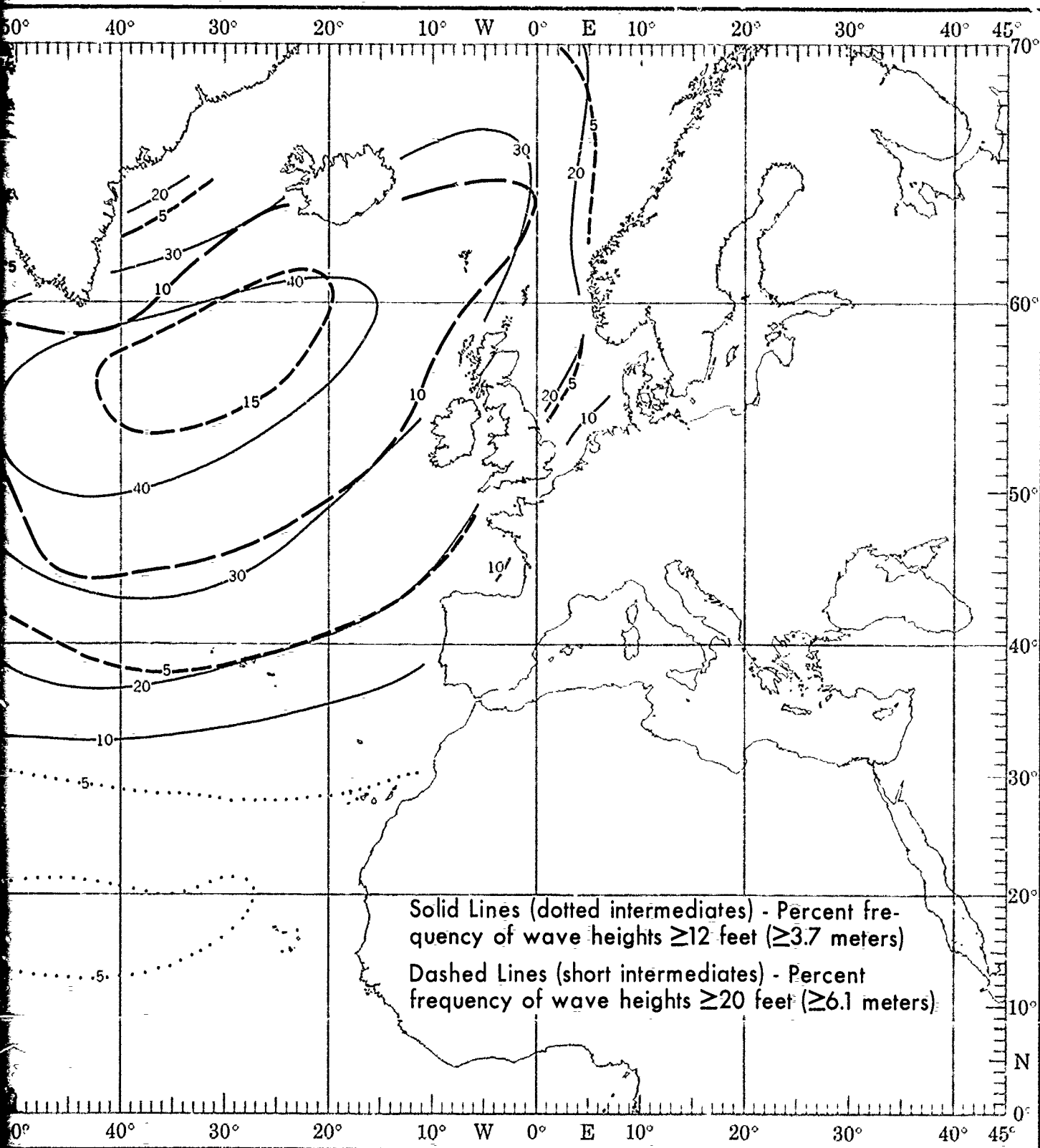


# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)



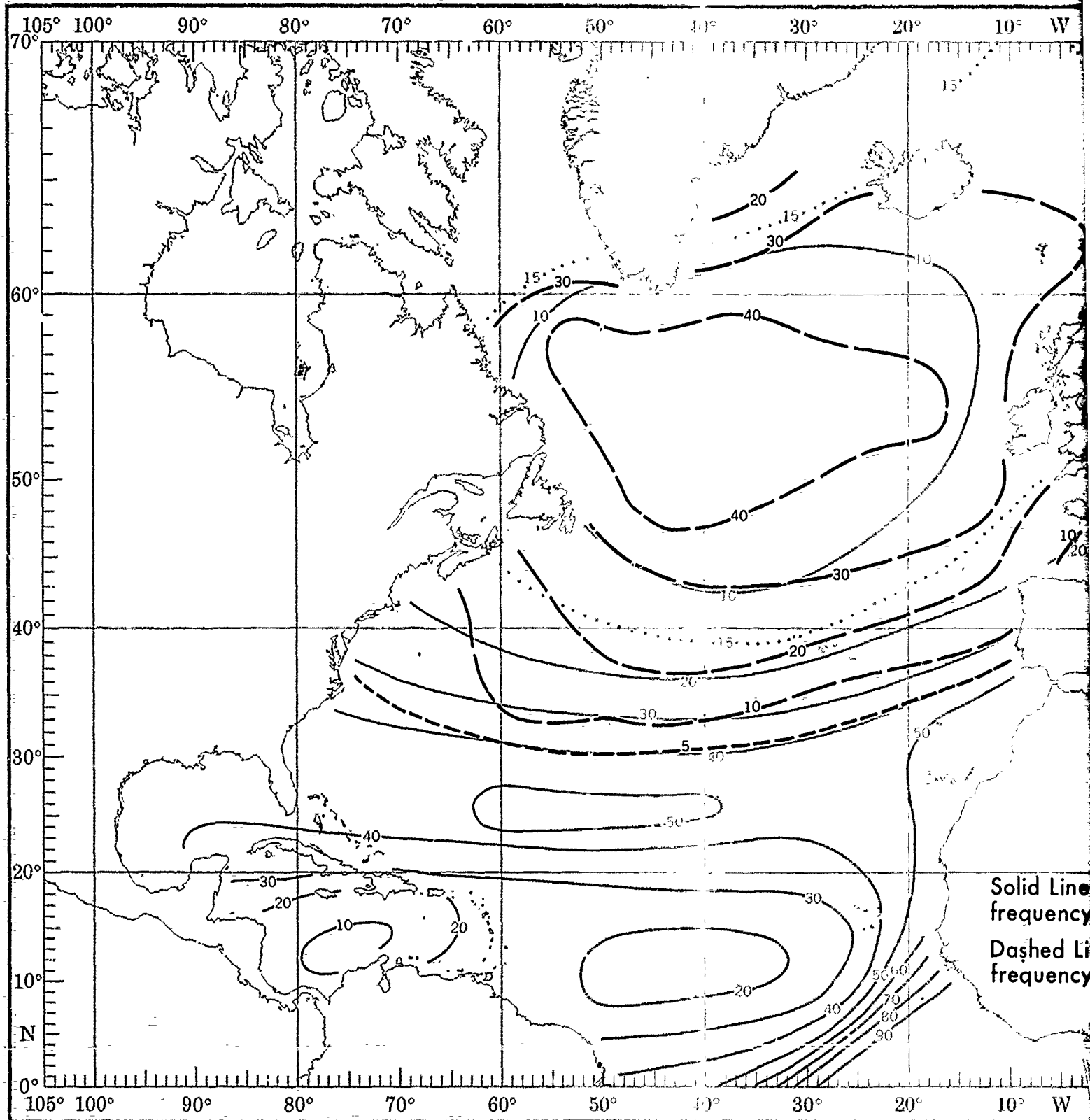
ET)

# ANNUAL



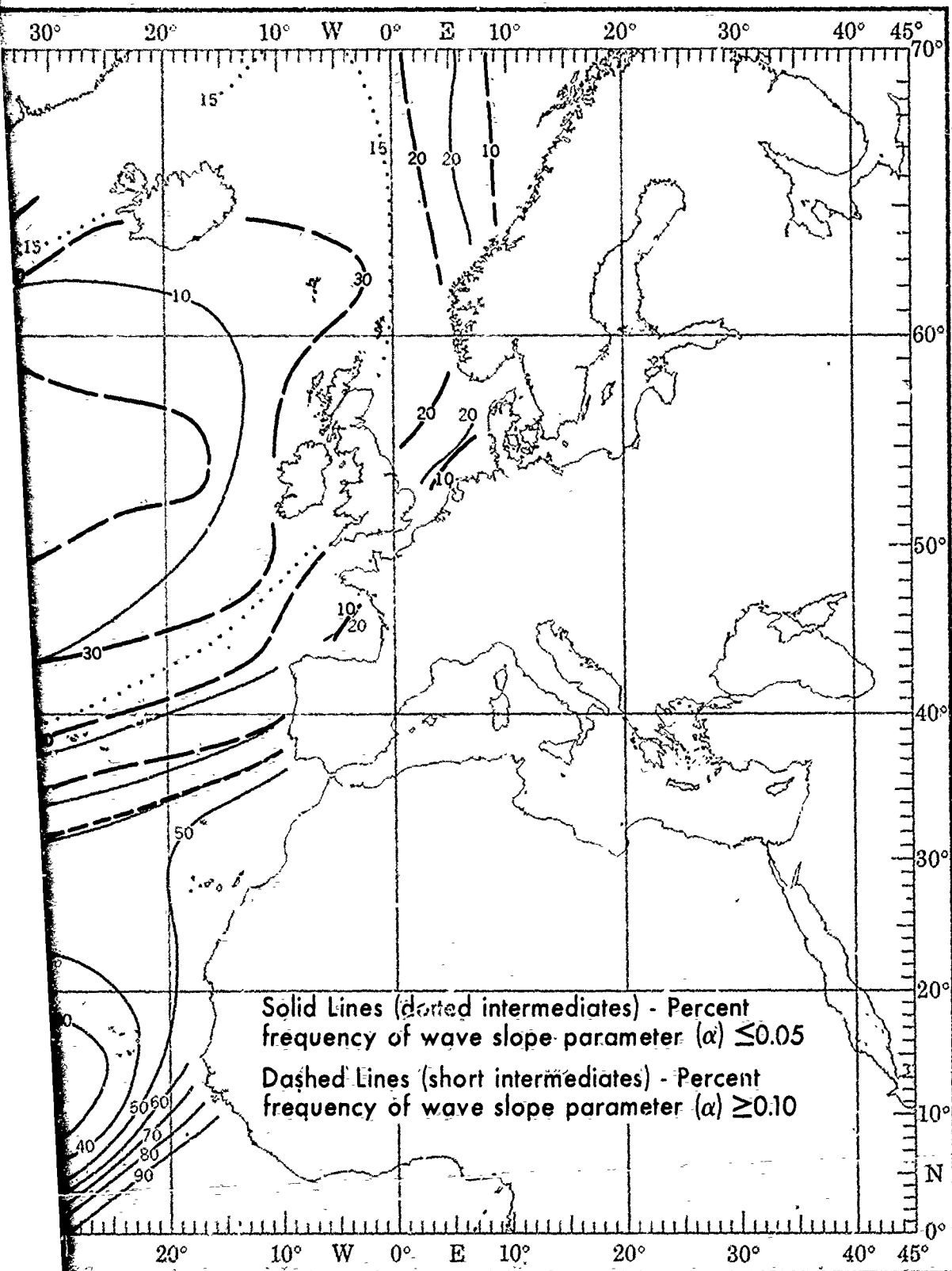
# JANUARY

# WAVE

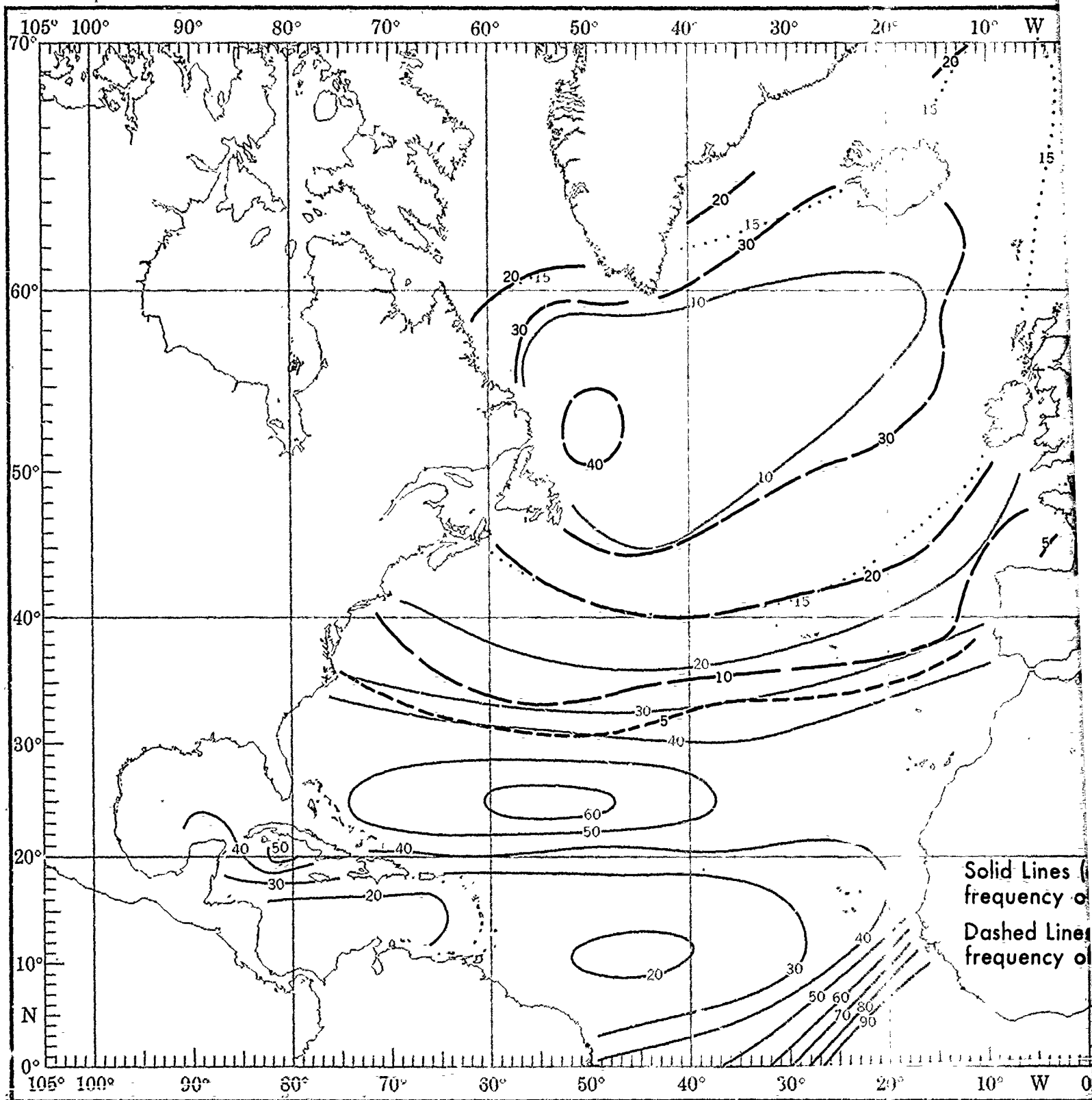


Solid Line  
frequency  
Dashed Line  
frequency

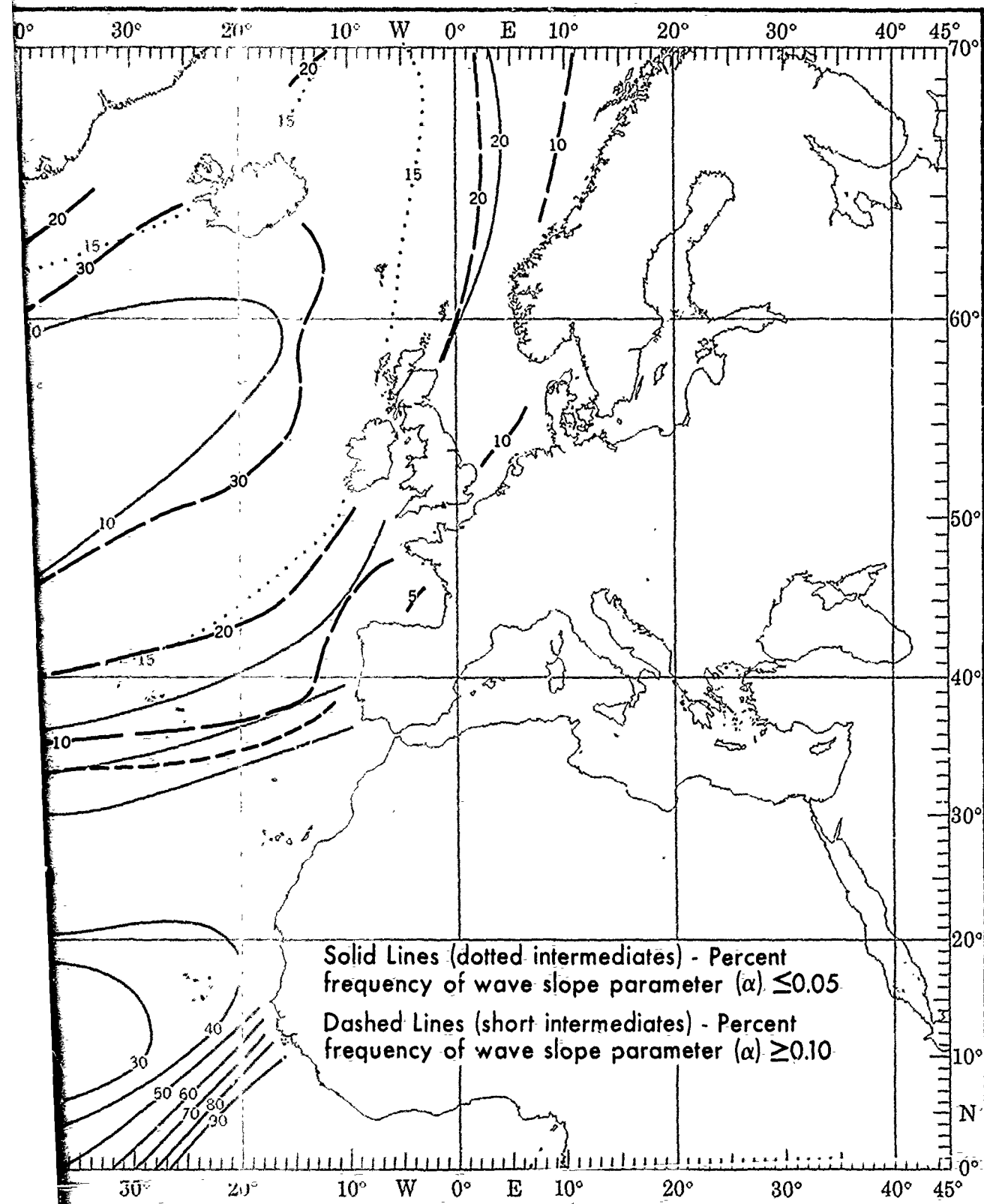
# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )



# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )

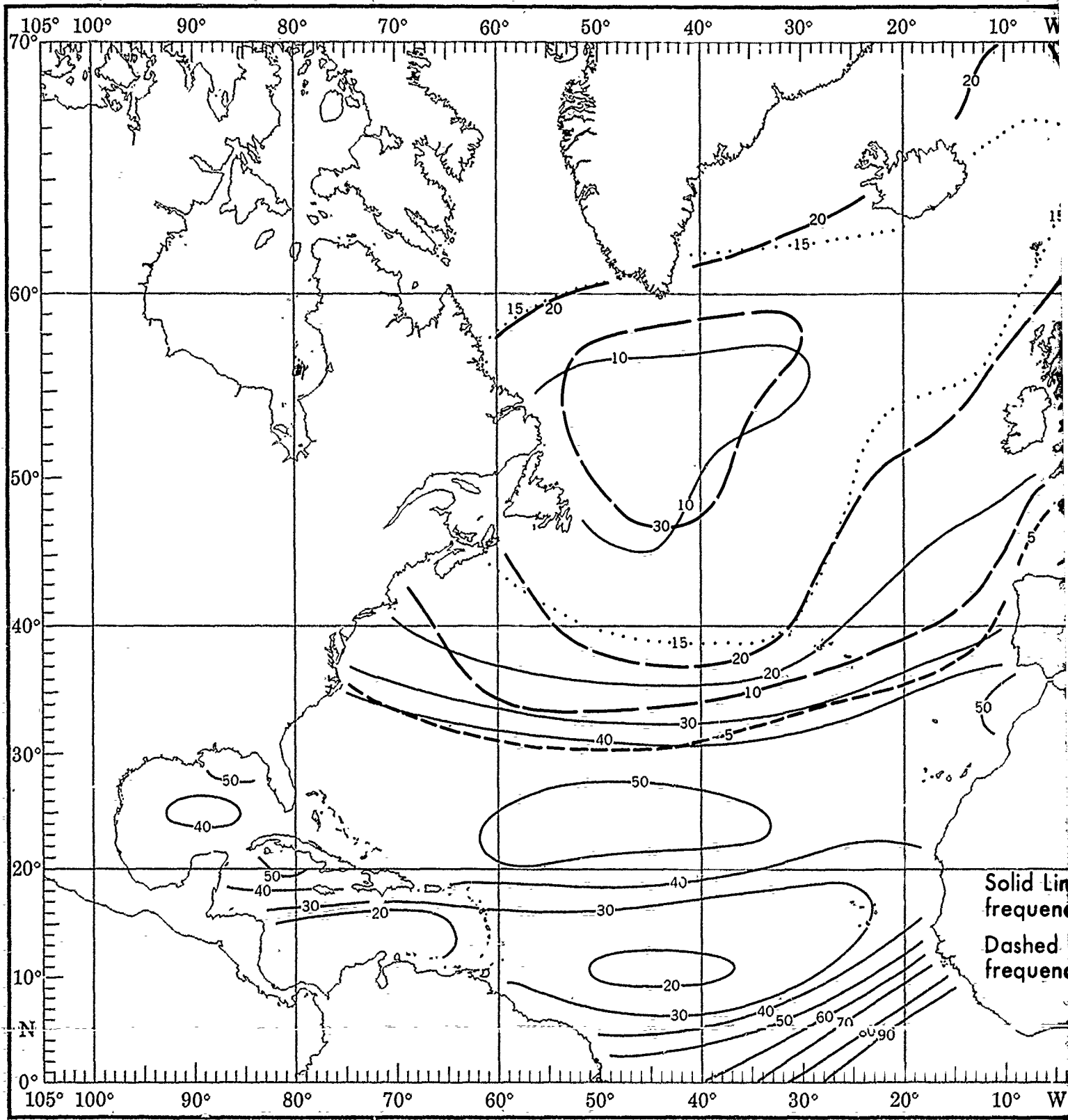


# FEBRUARY



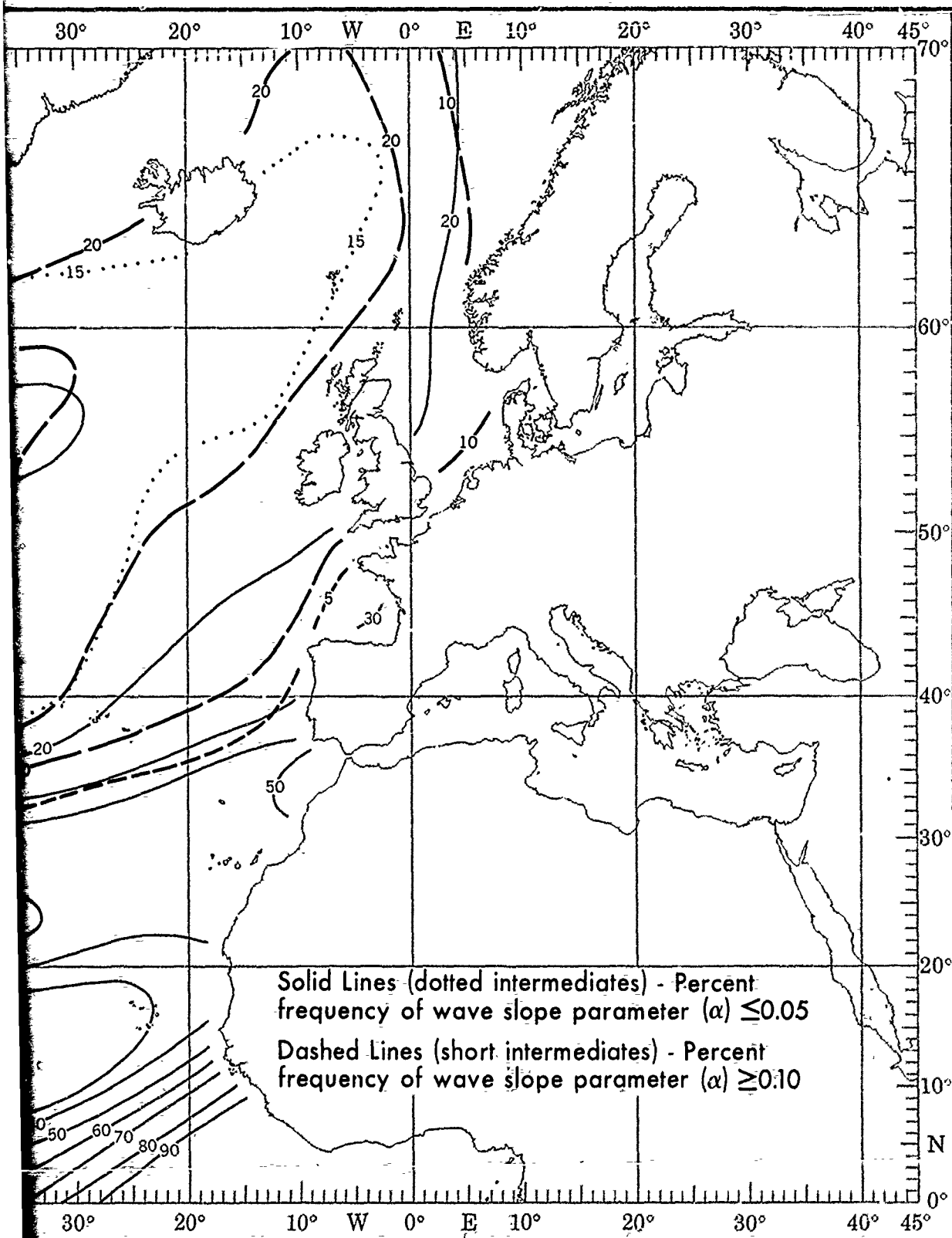
MARCH

WAV

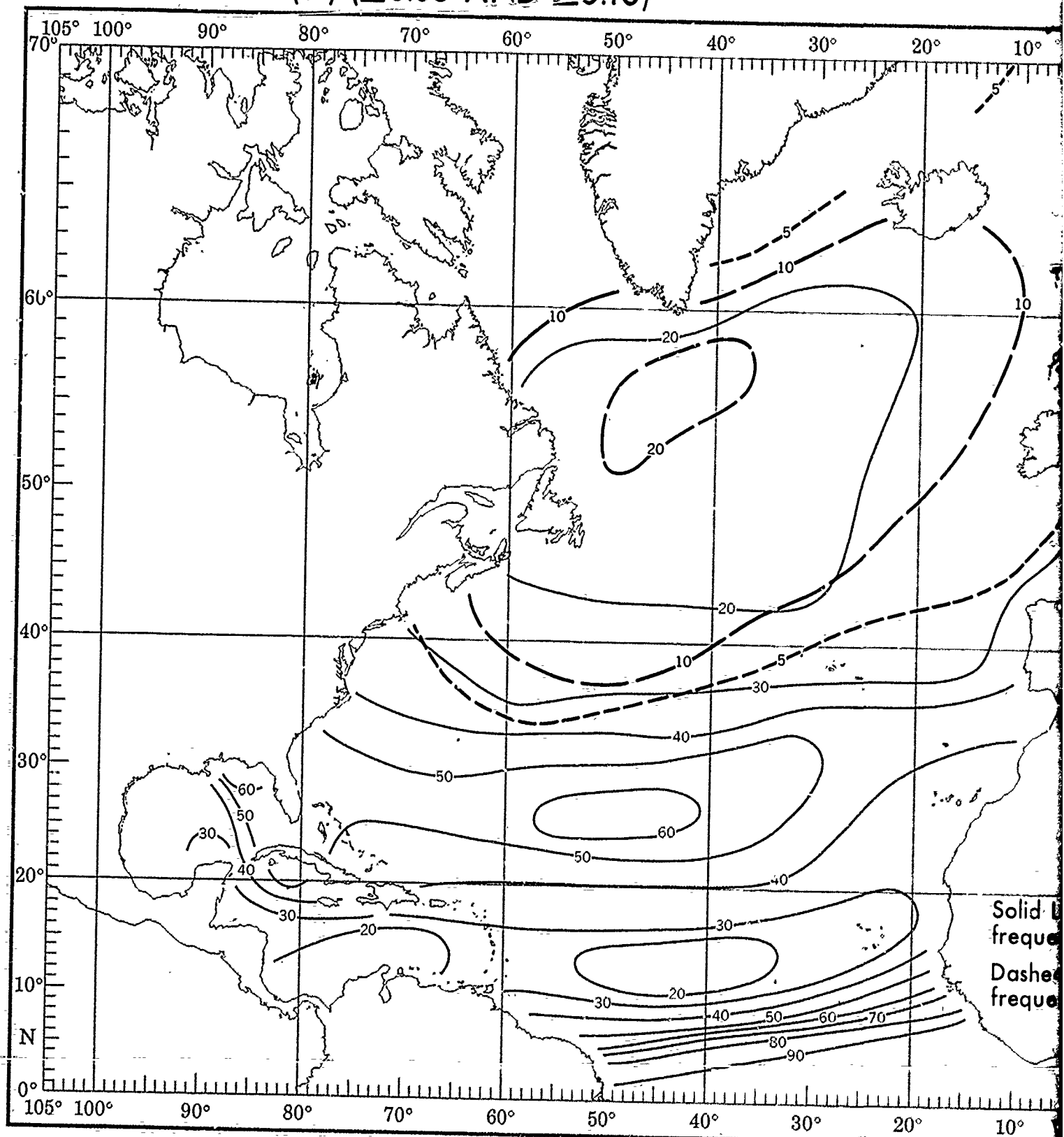




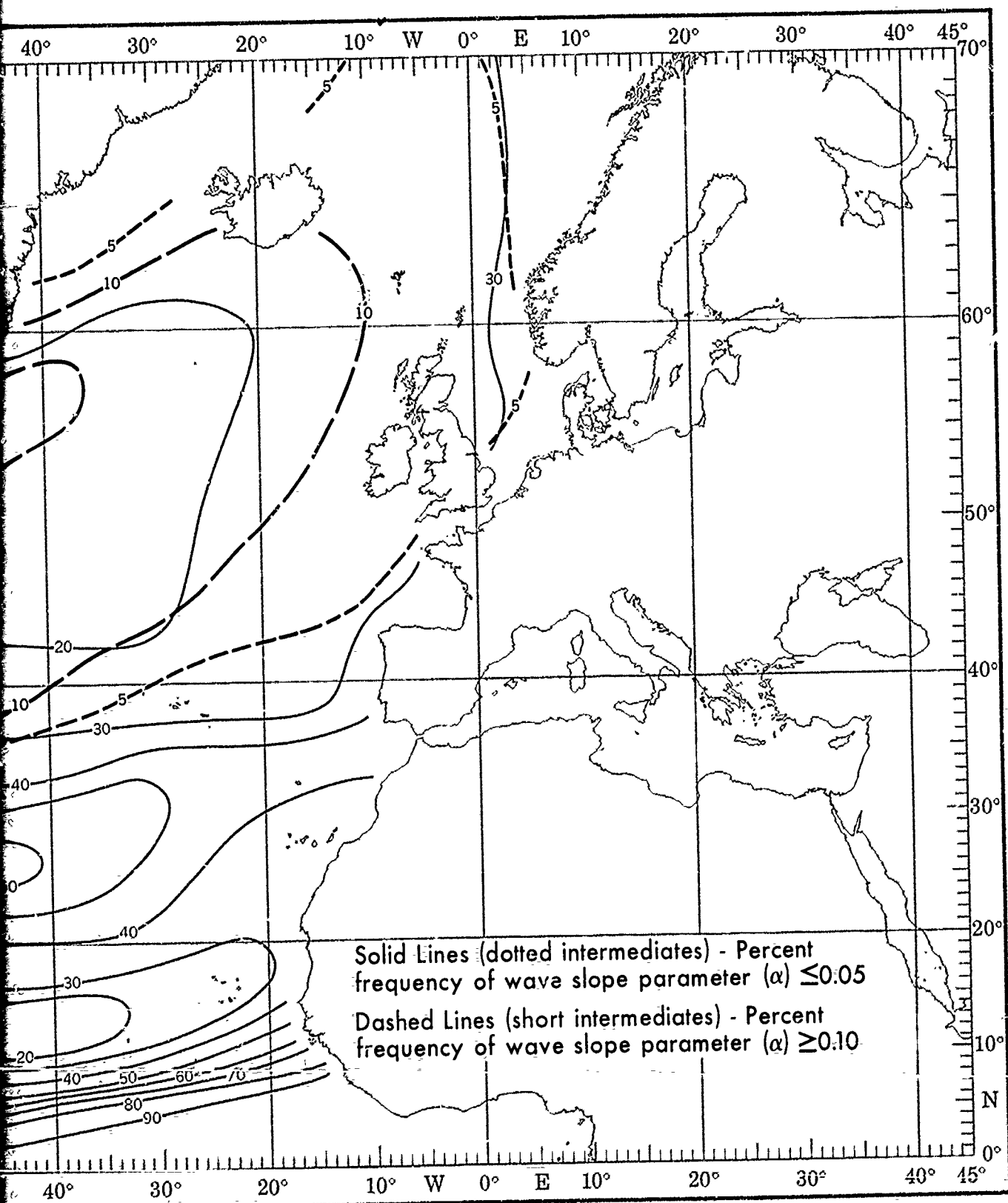
# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )



# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )

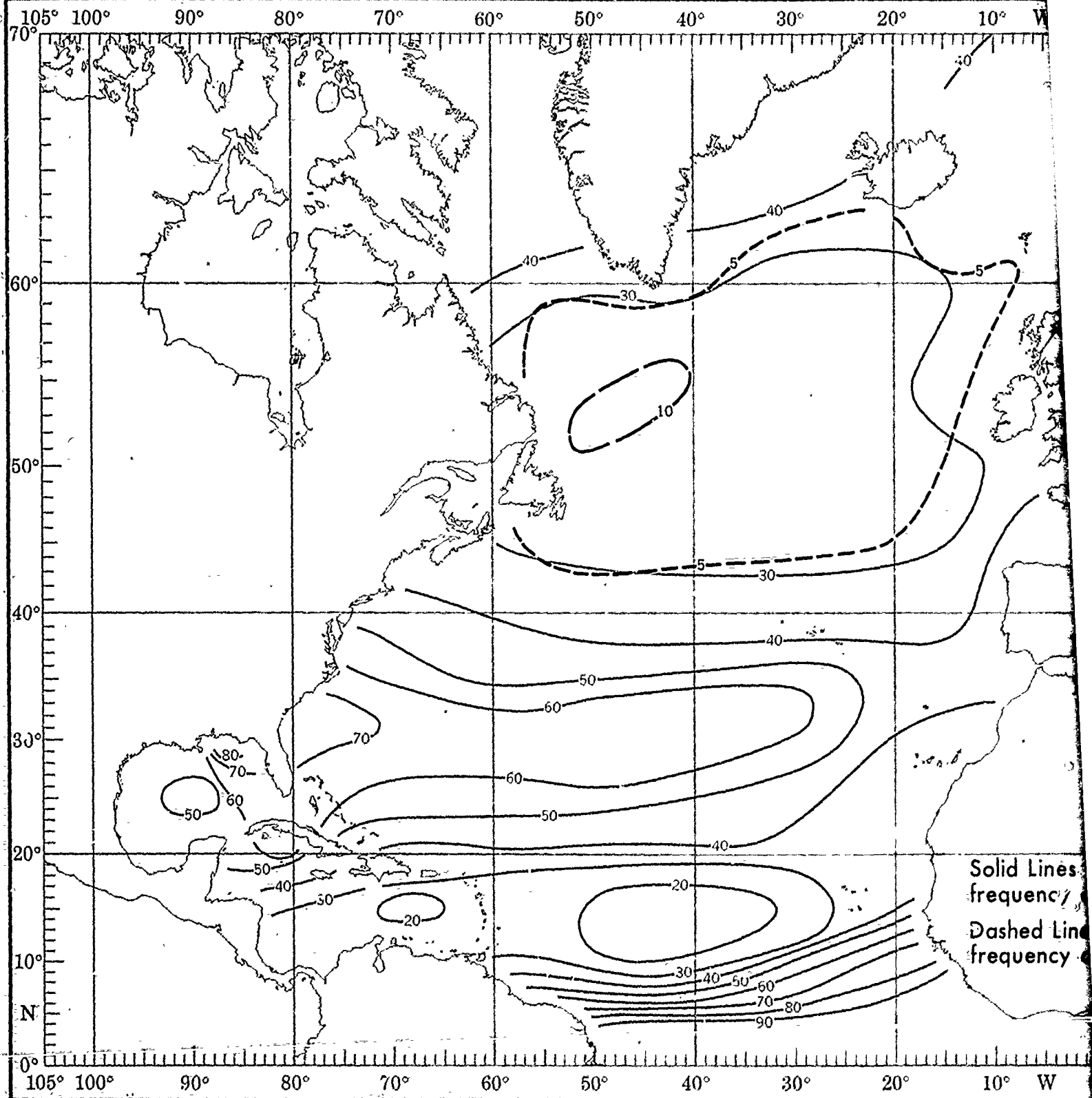


APRIL

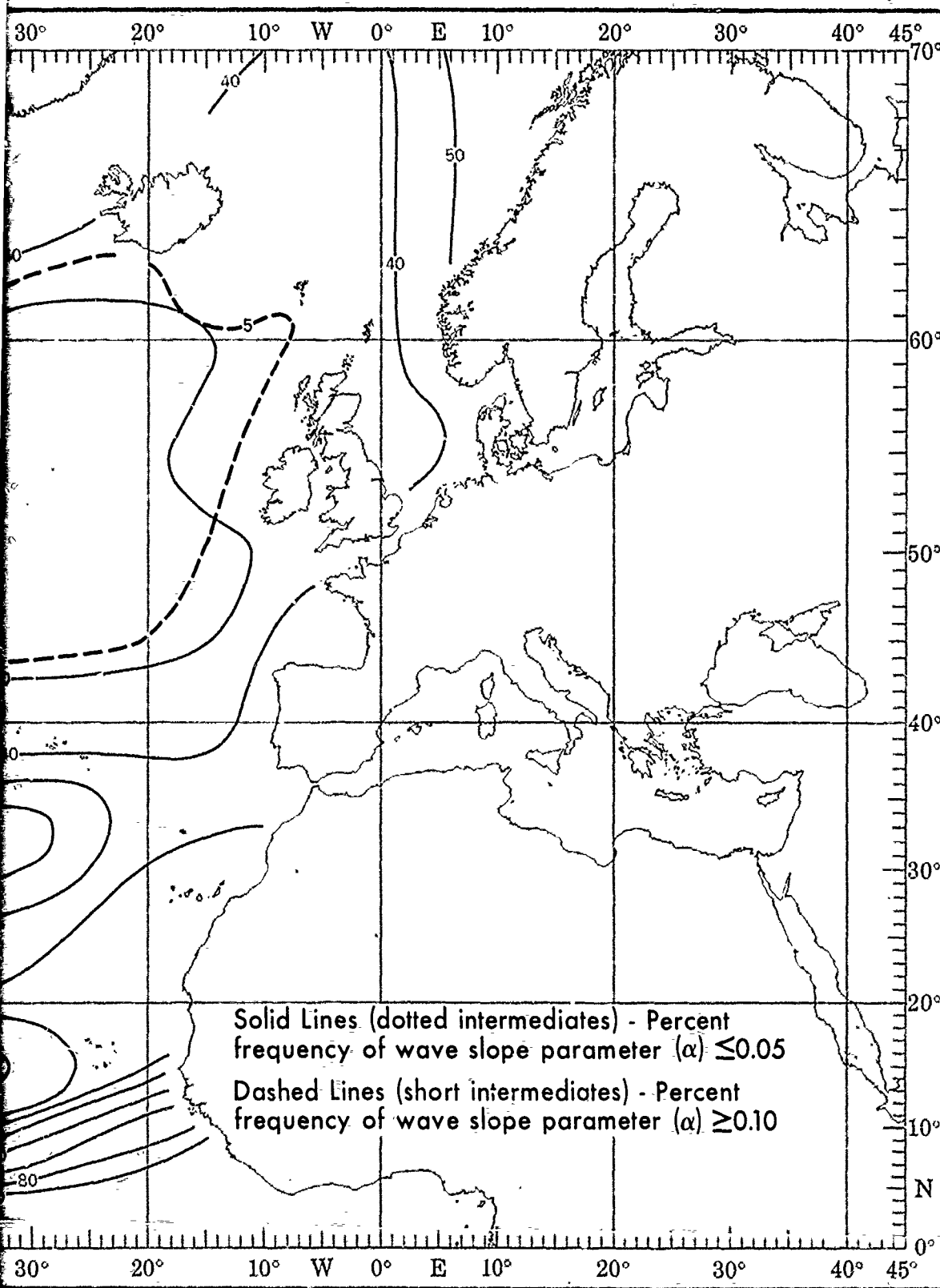


MAY

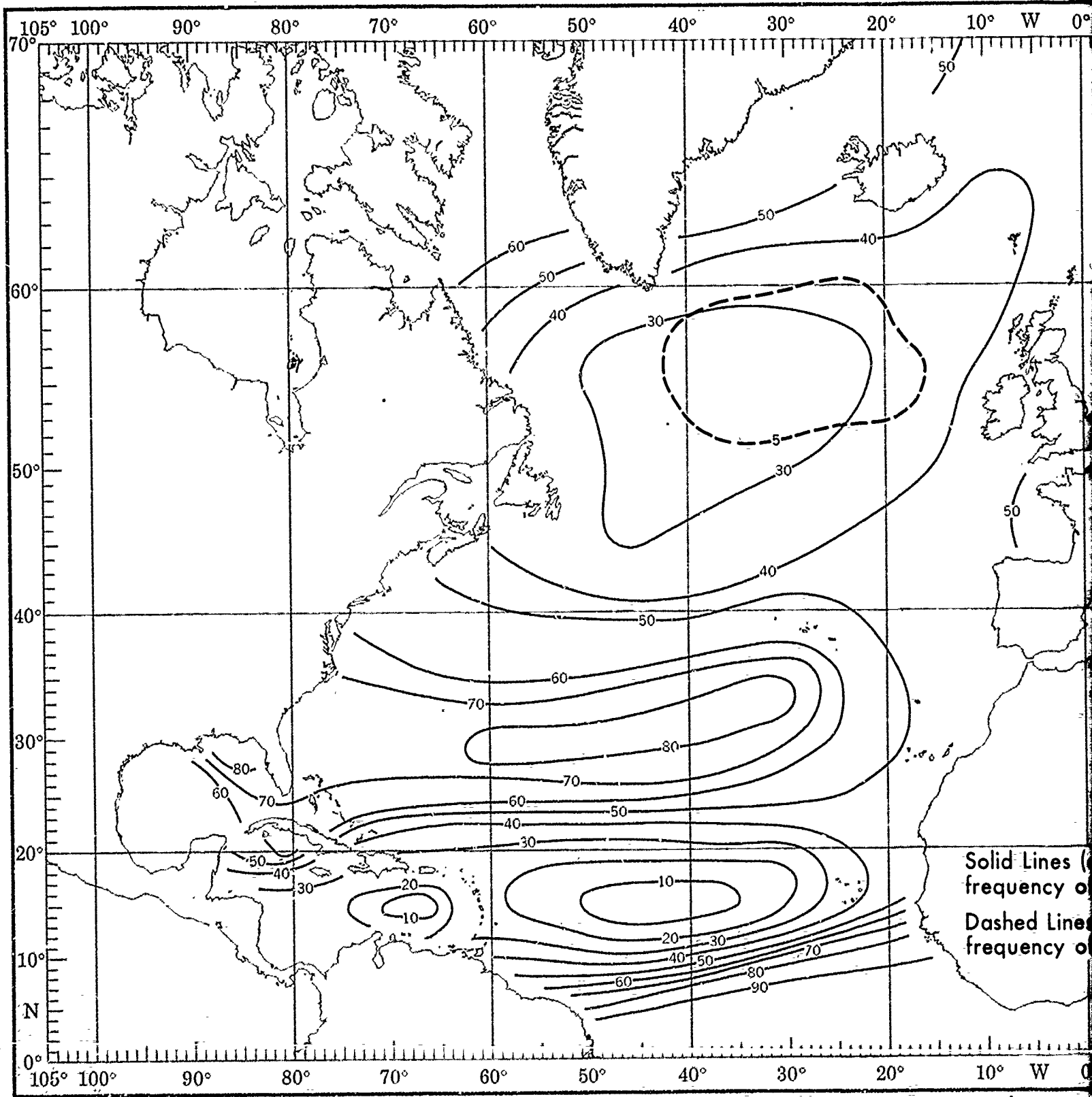
WAV



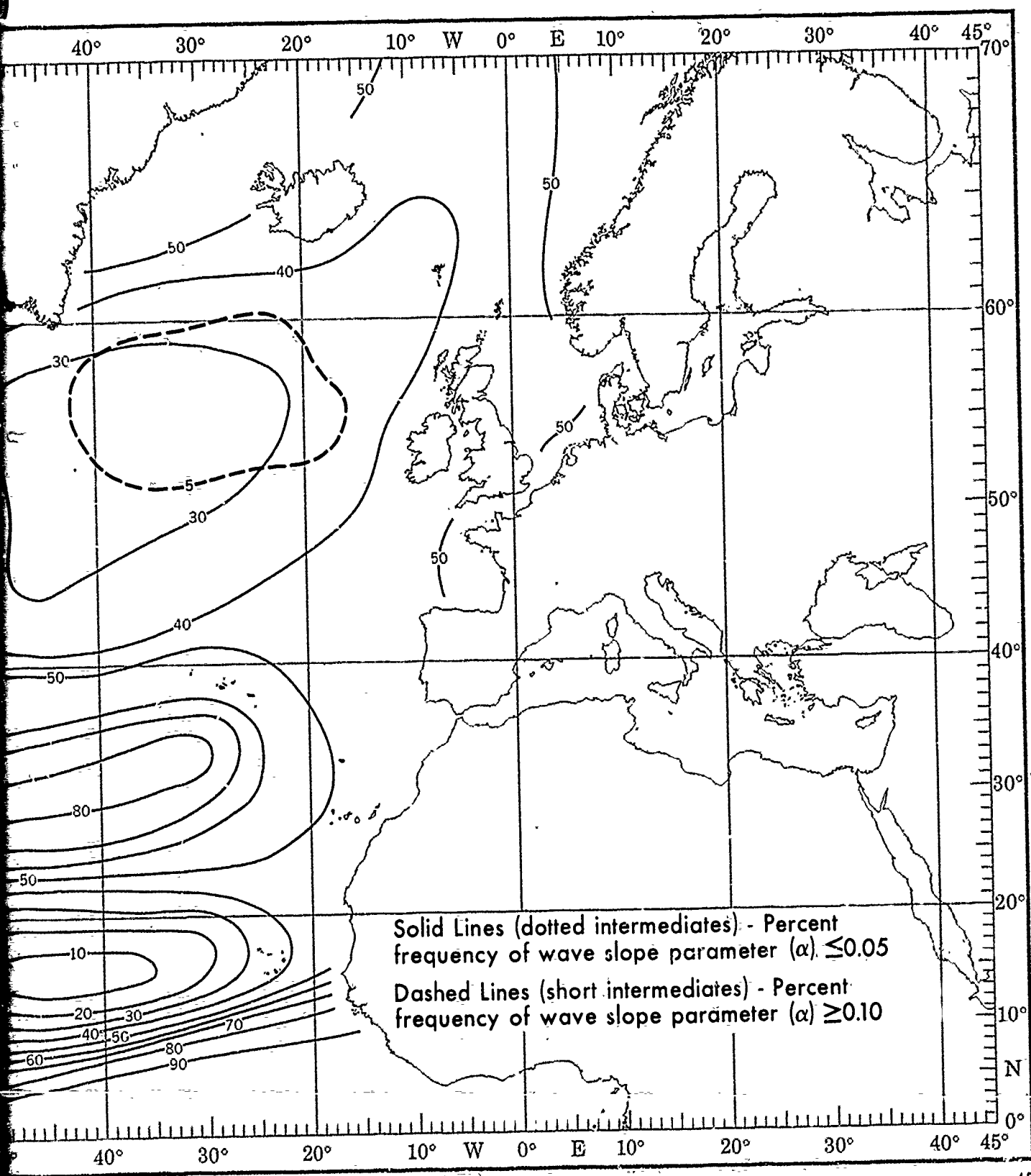
# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )



# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )



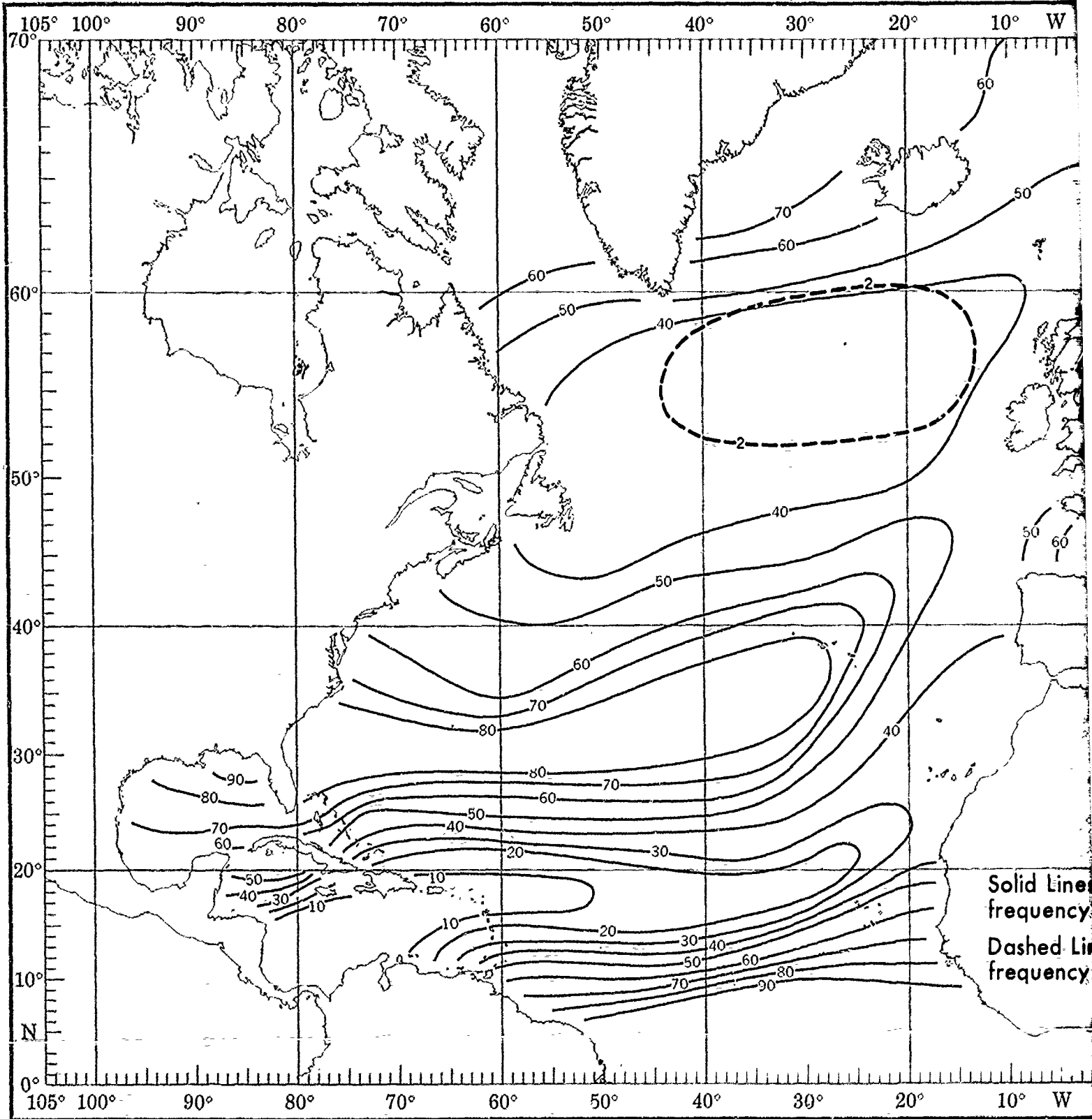
# JUNE



Solid Lines (dotted intermediates) - Percent frequency of wave slope parameter ( $\alpha$ )  $\leq 0.05$   
 Dashed Lines (short intermediates) - Percent frequency of wave slope parameter ( $\alpha$ )  $\geq 0.10$

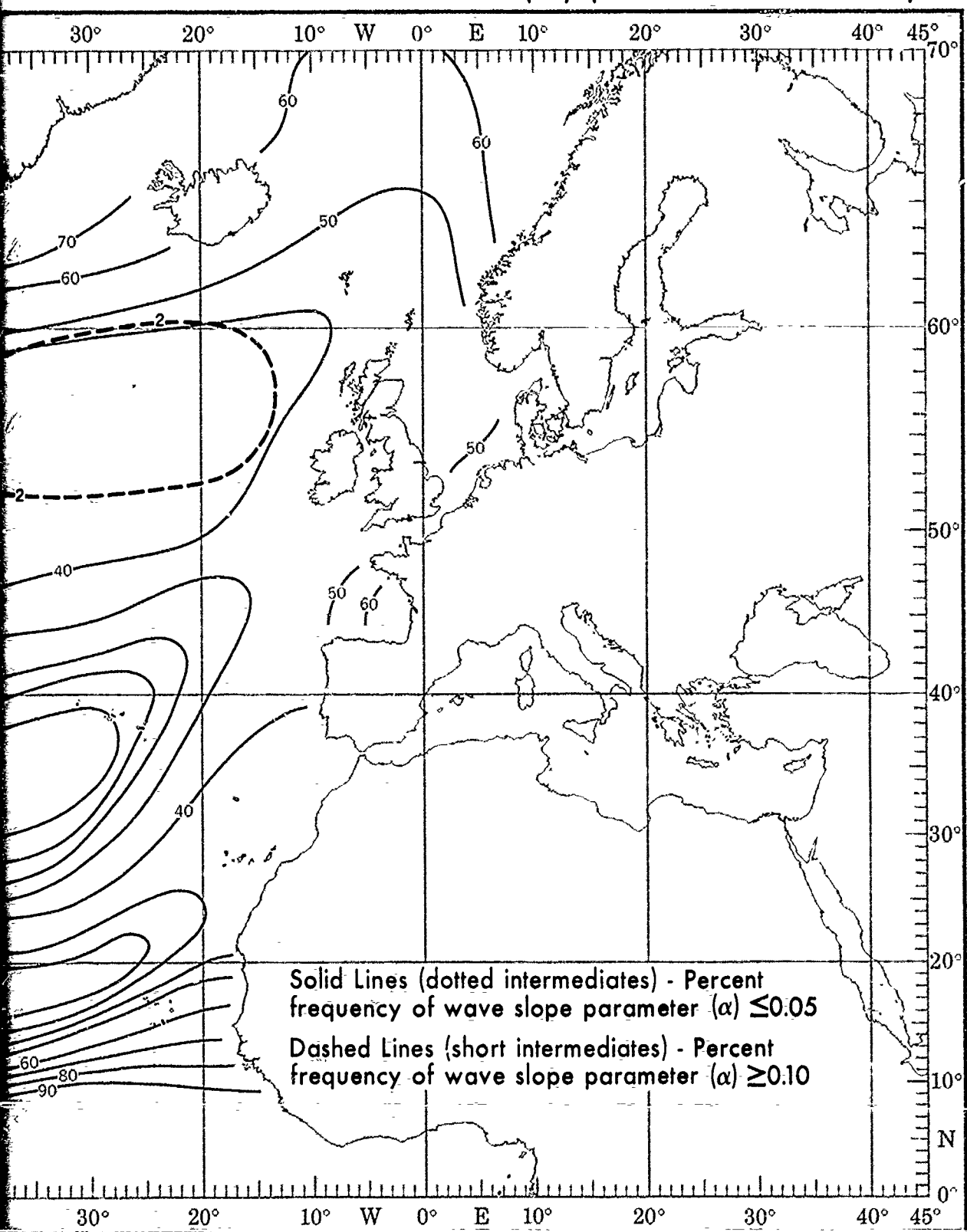
JULY

WAVE

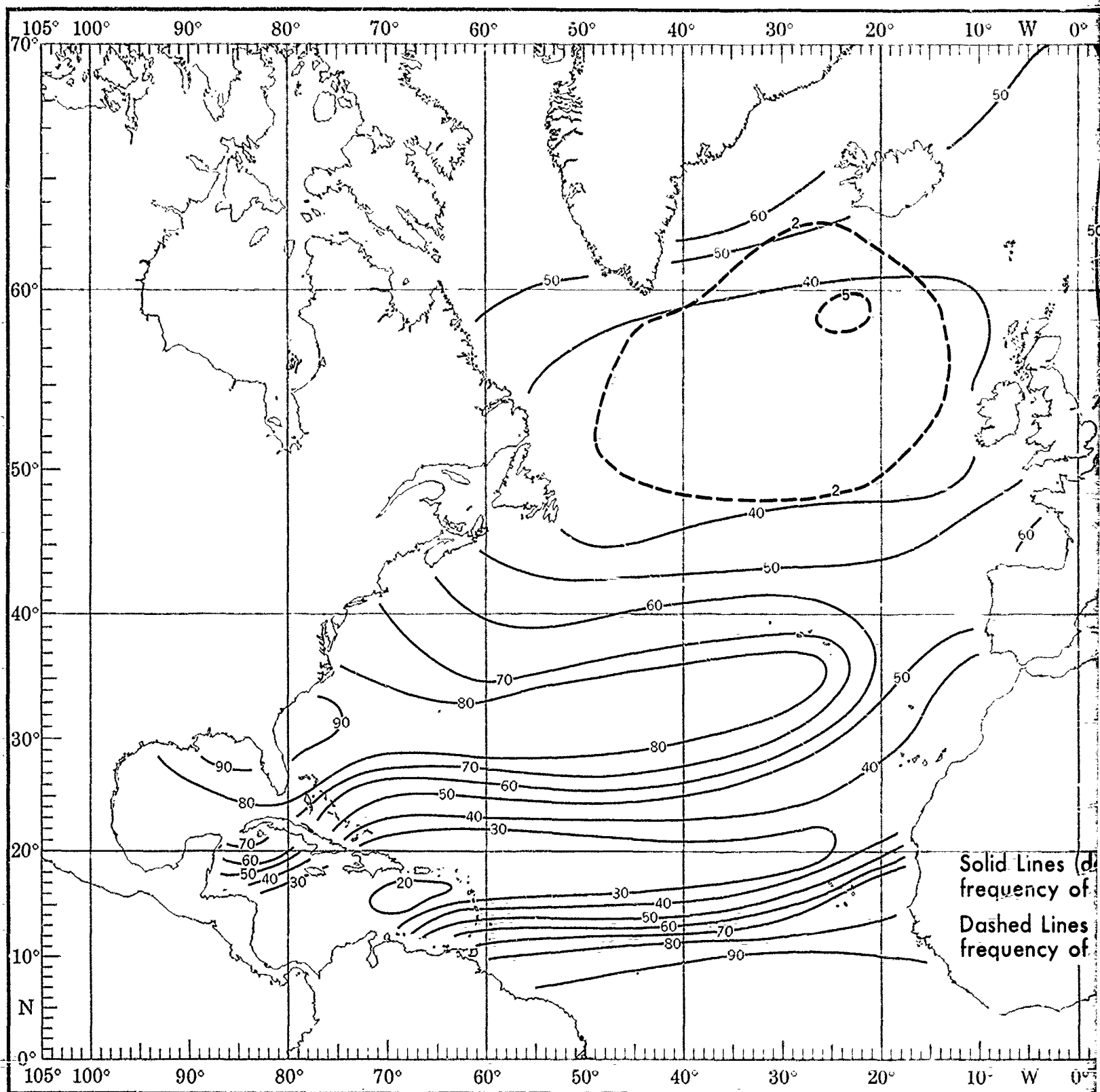




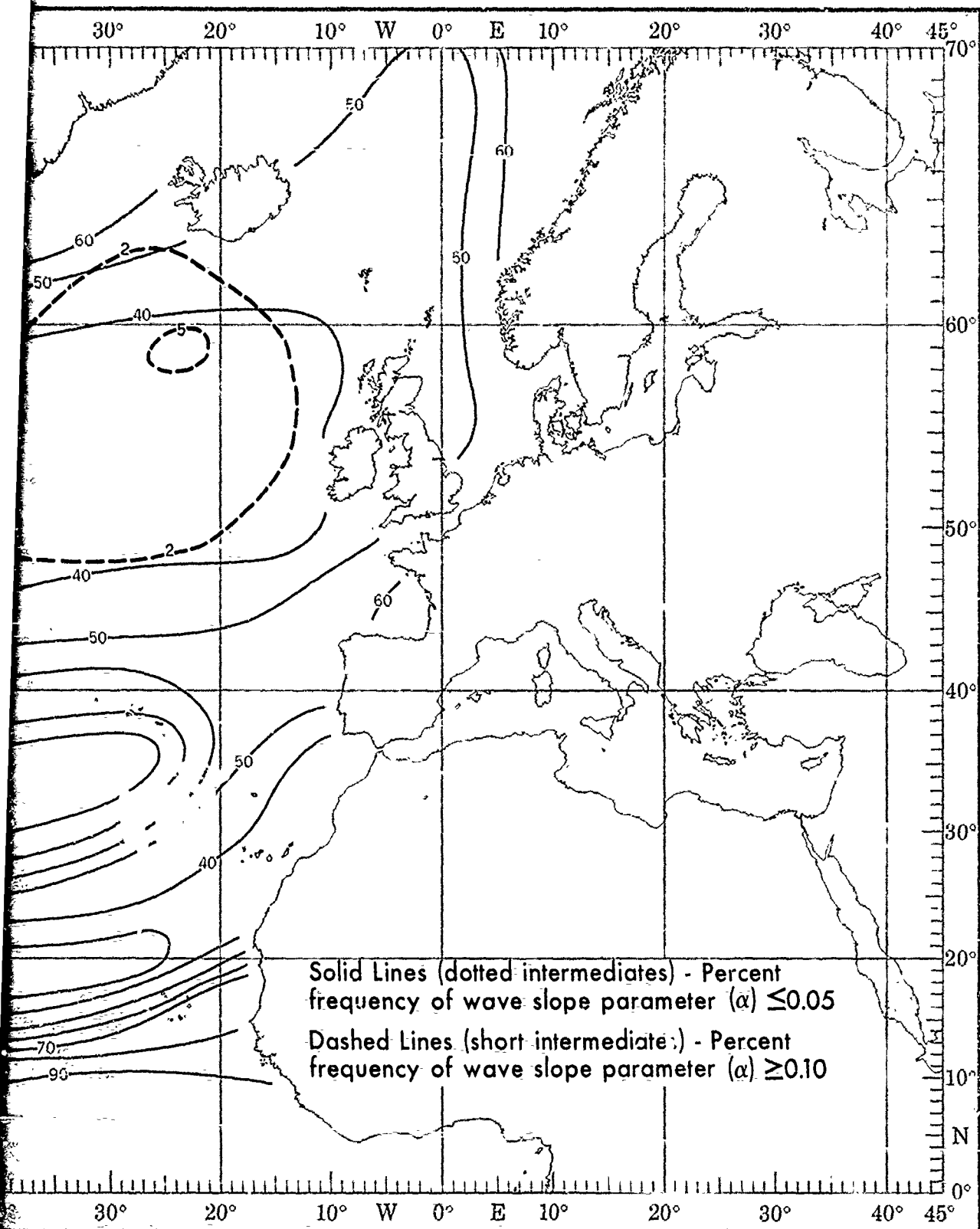
# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )



# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )

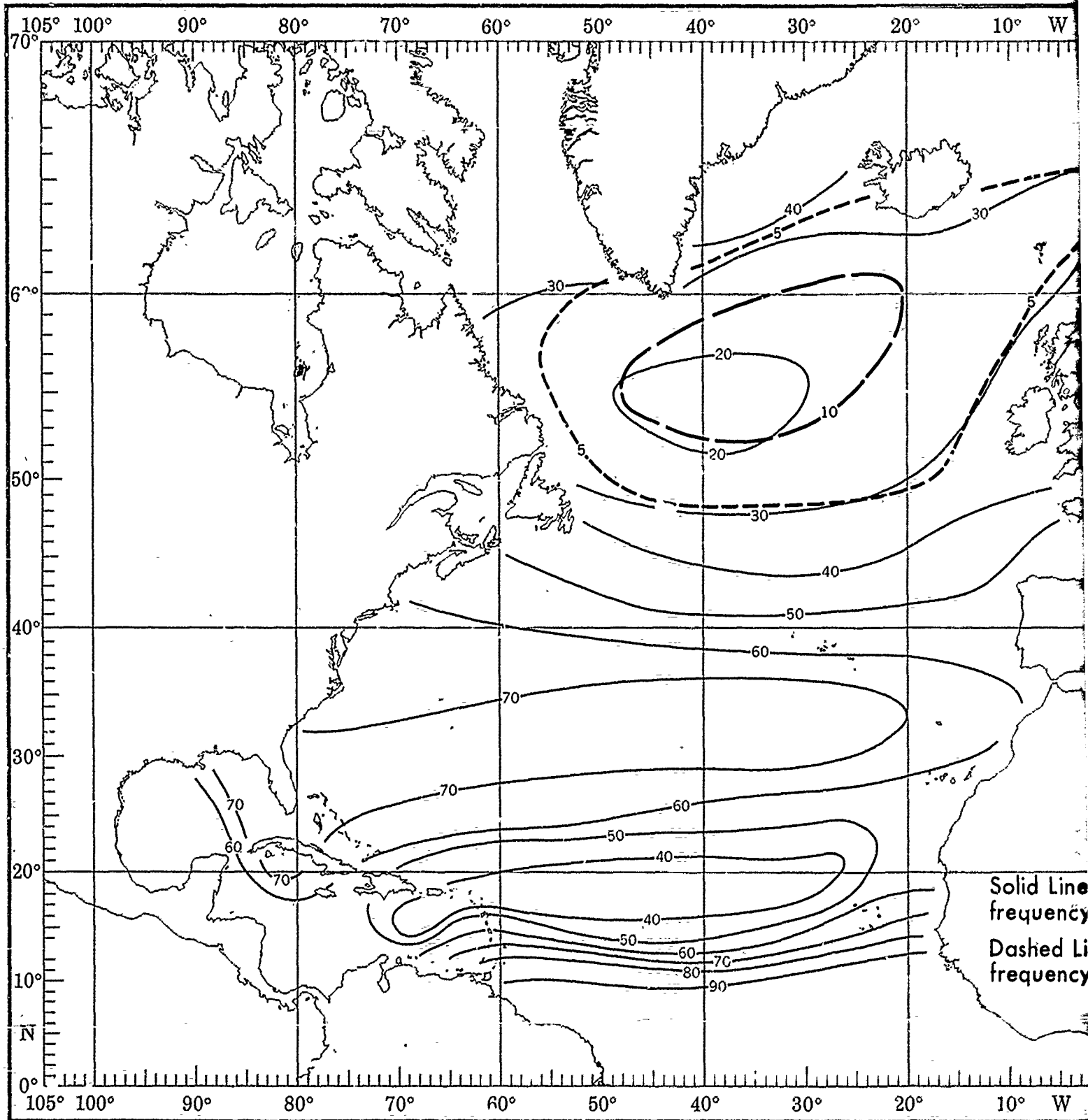


# AUGUST

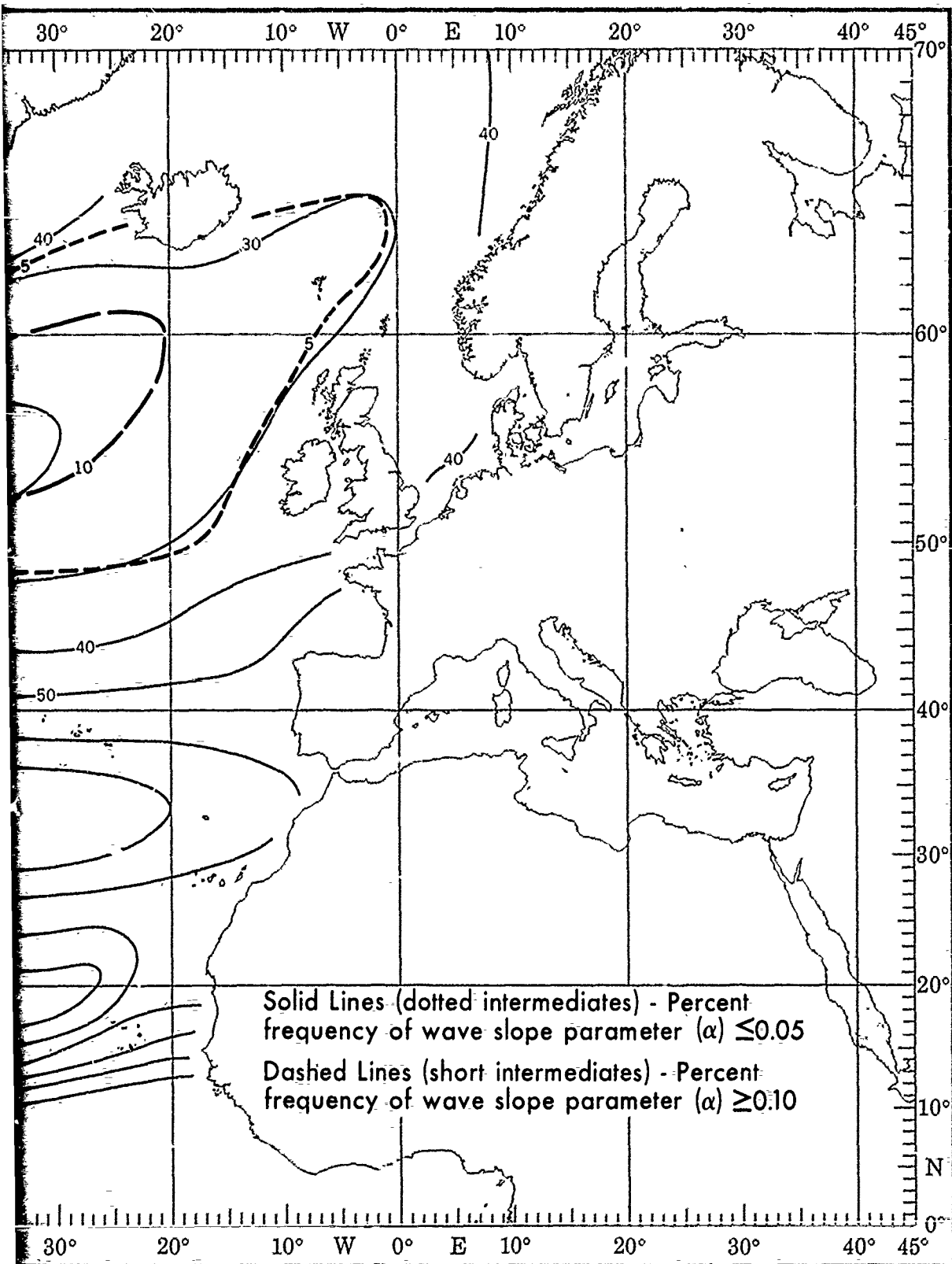


SEPTEMBER

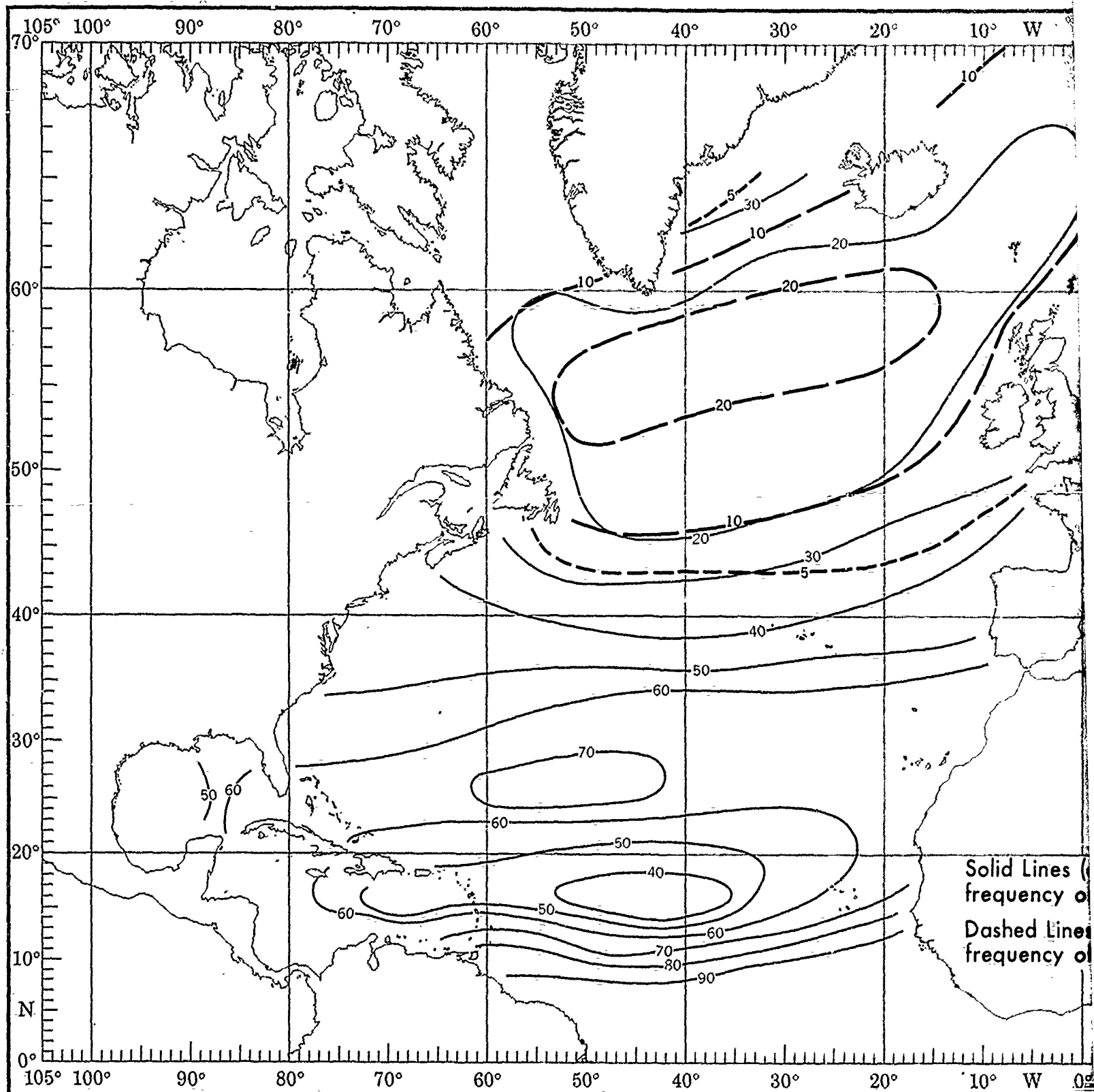
WAVE



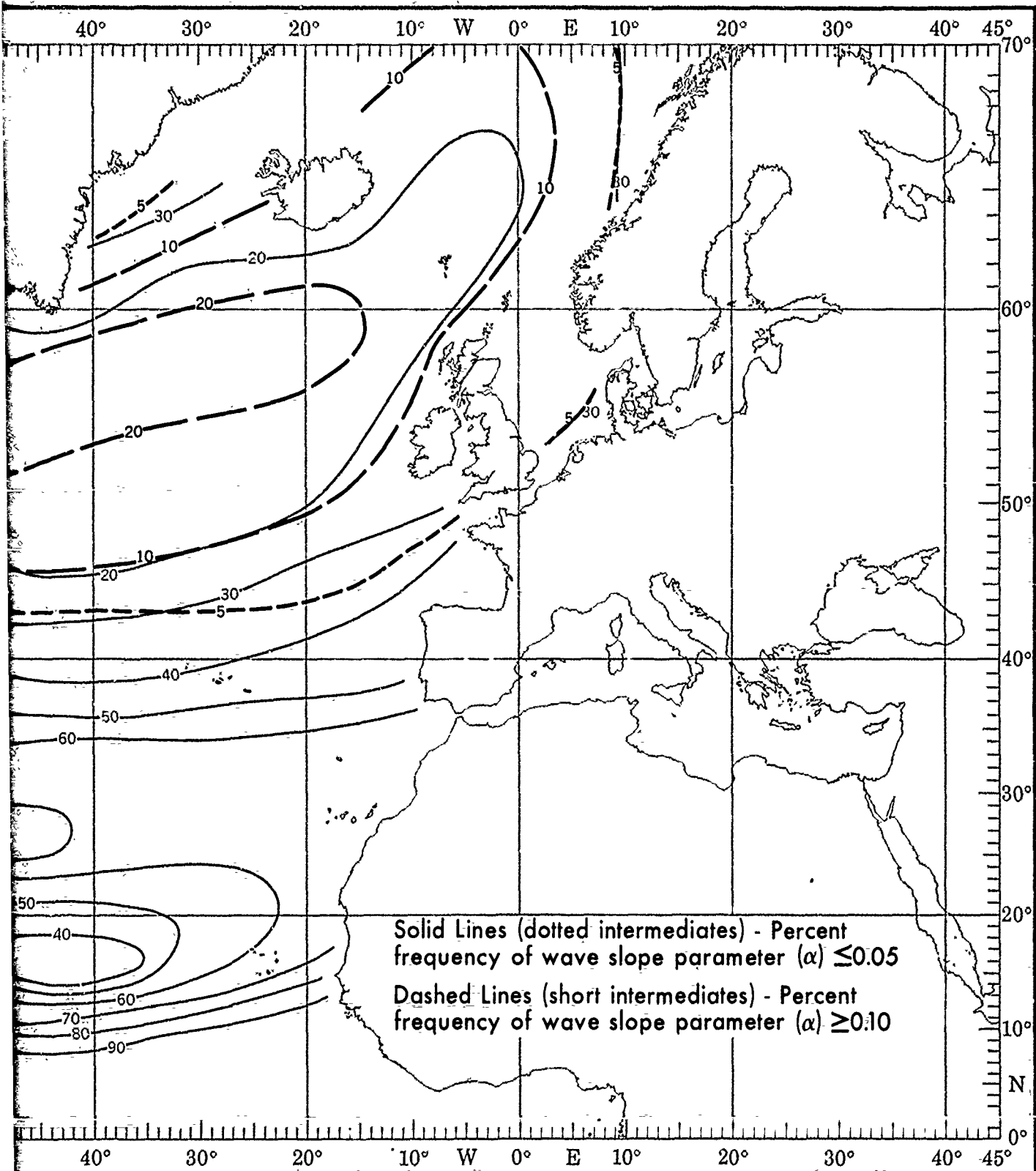
# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )



# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )

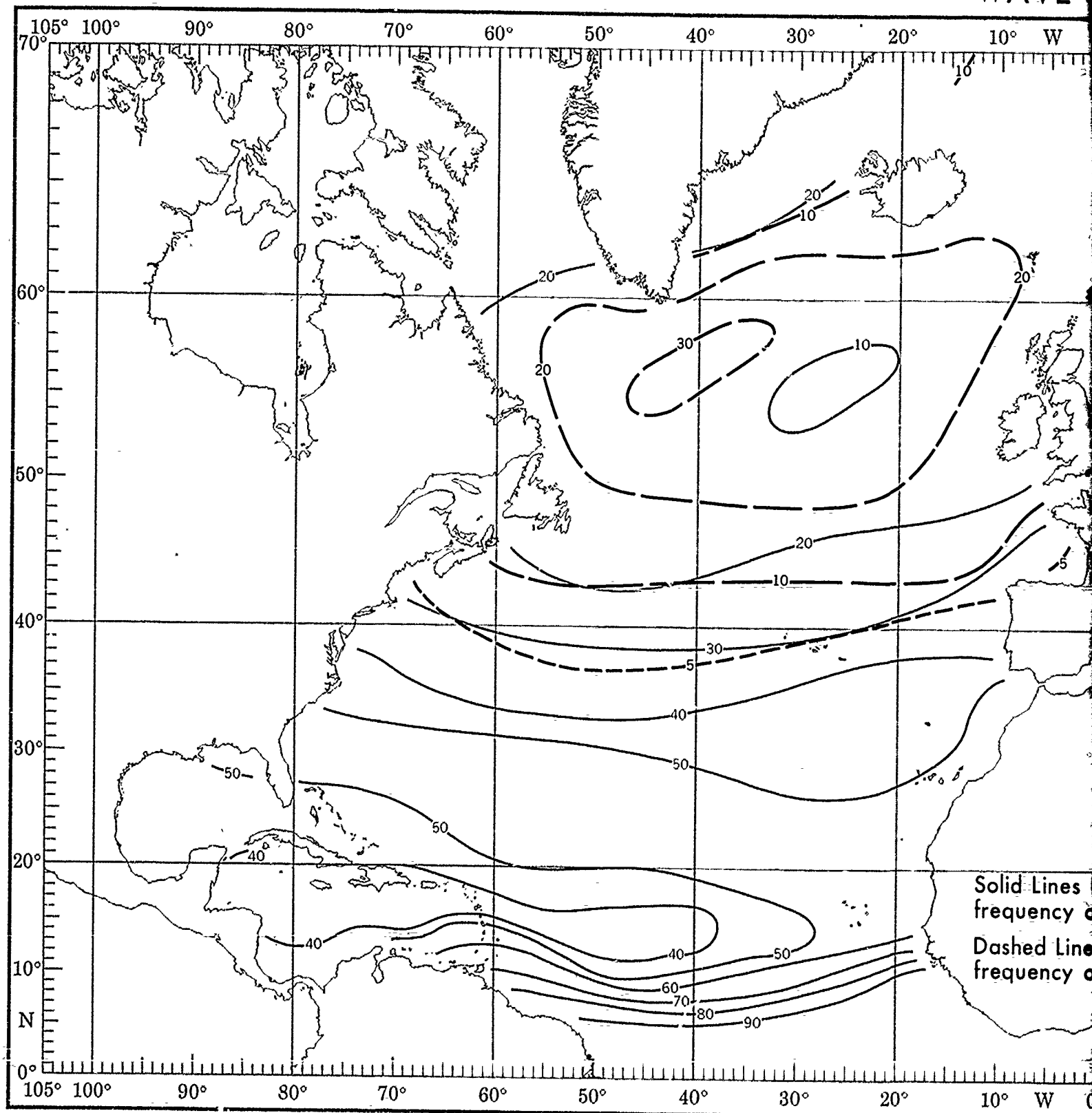


# OCTOBER



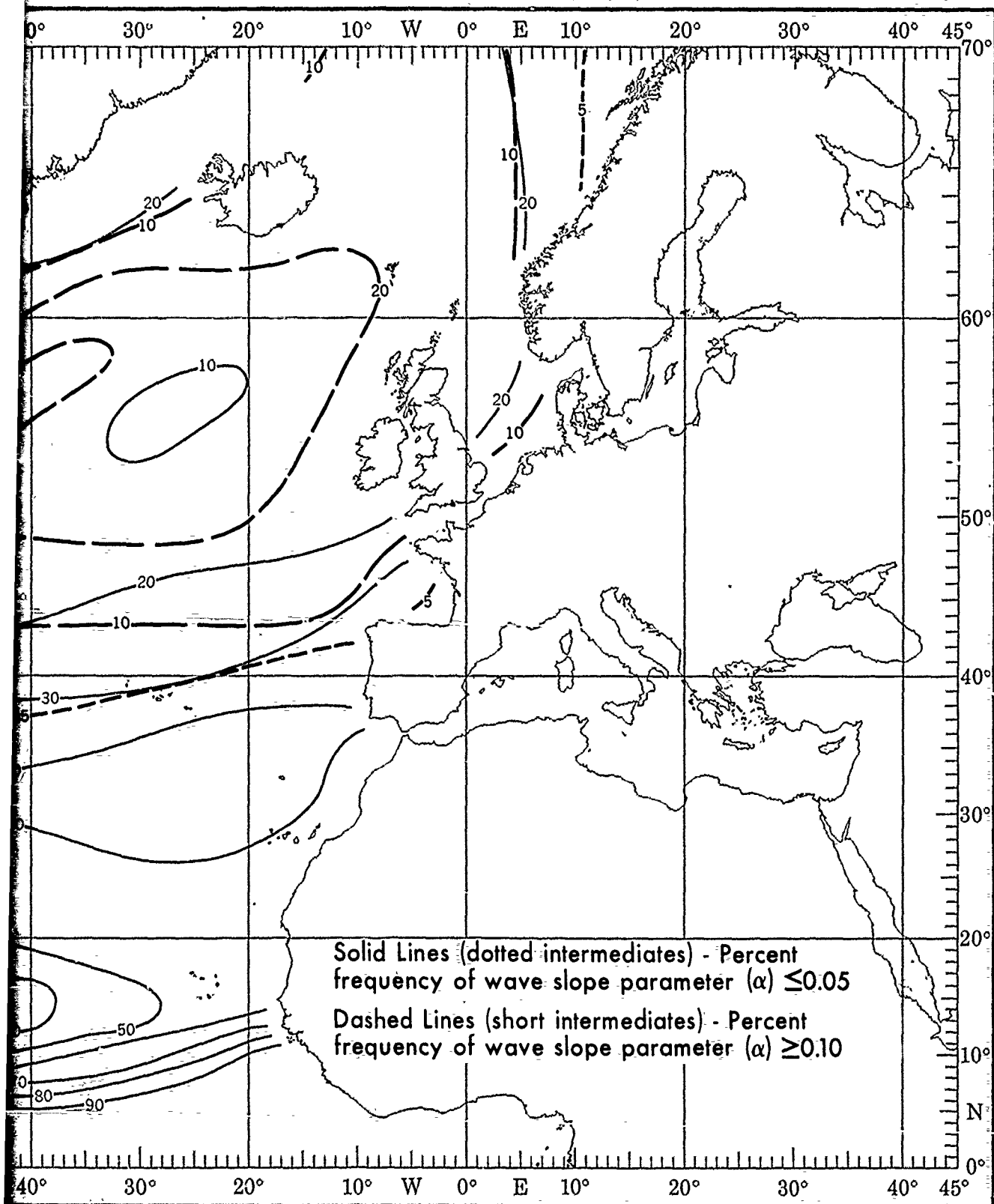
# NOVEMBER

# WAVE

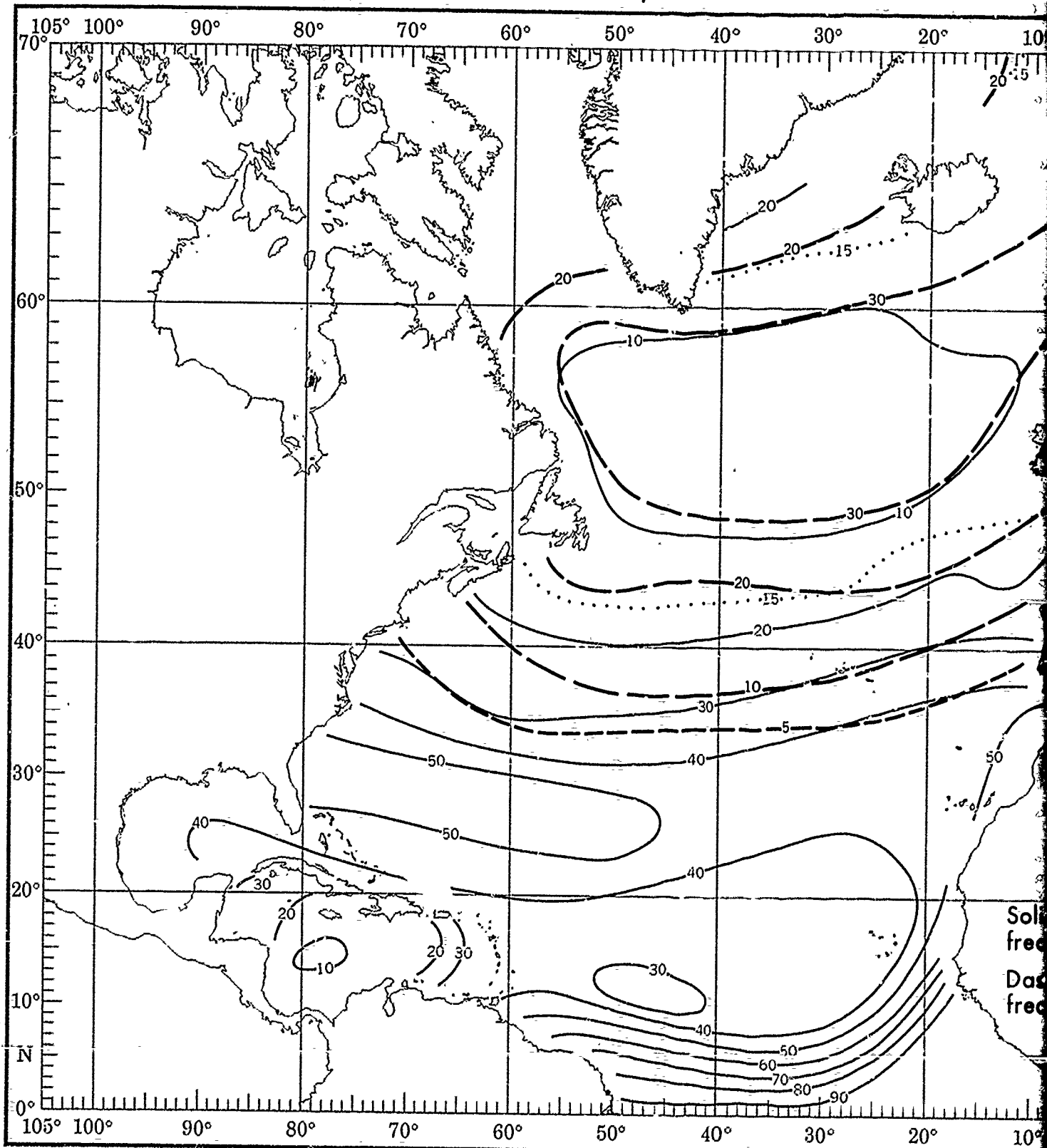




# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )

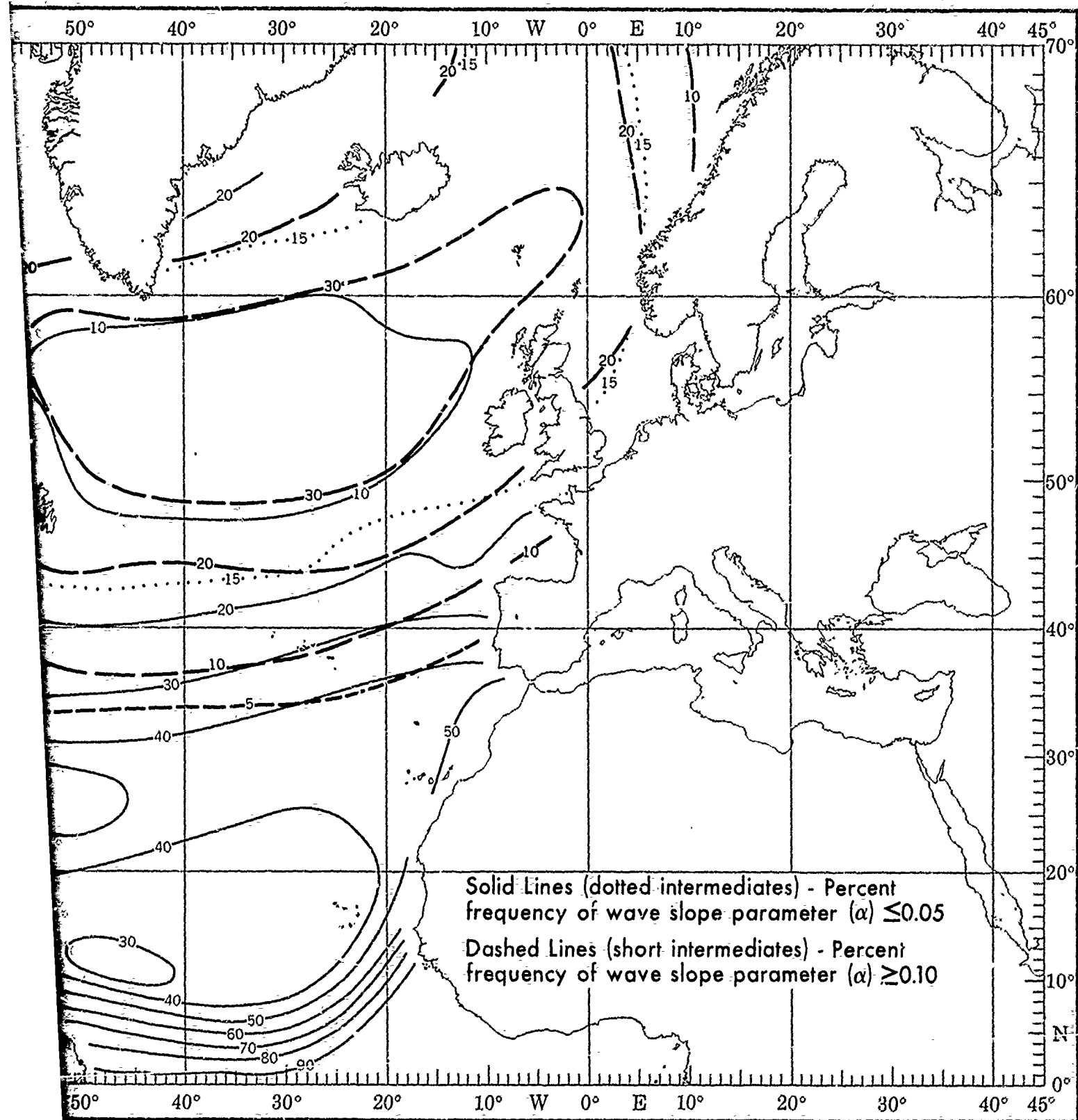


# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )



$\geq 0.10$ )

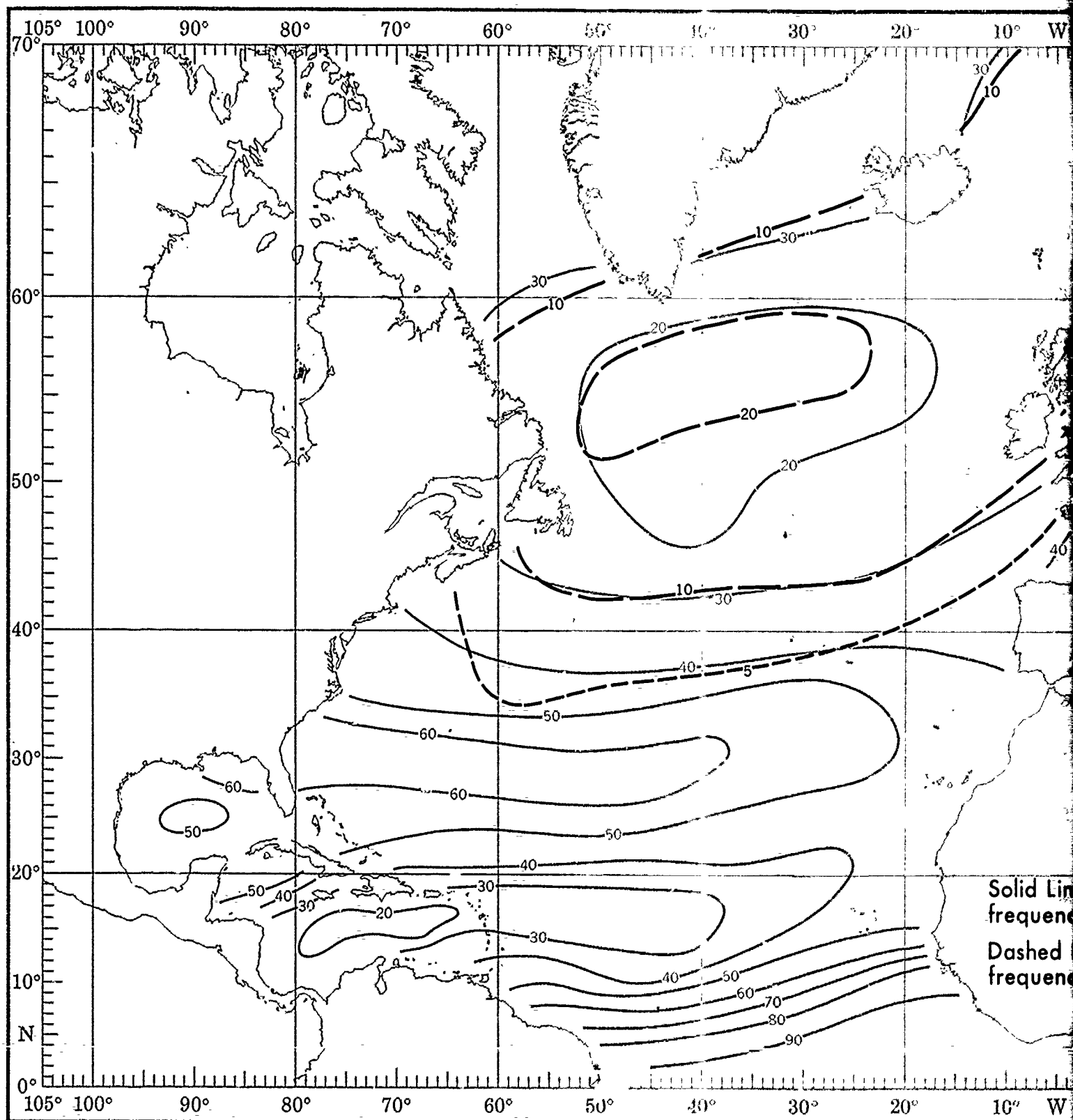
DECEMBER



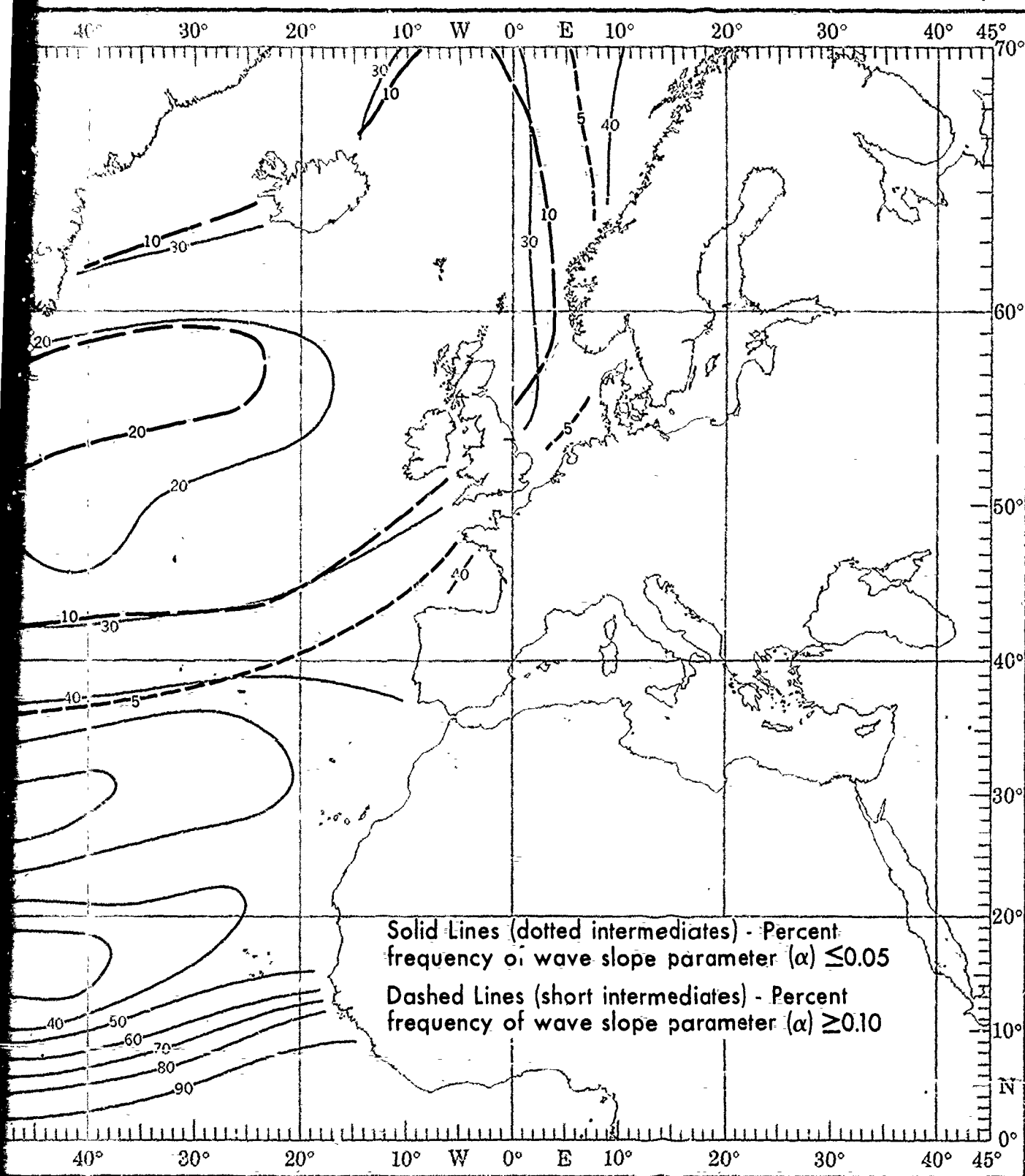
(2)

# ANNUAL

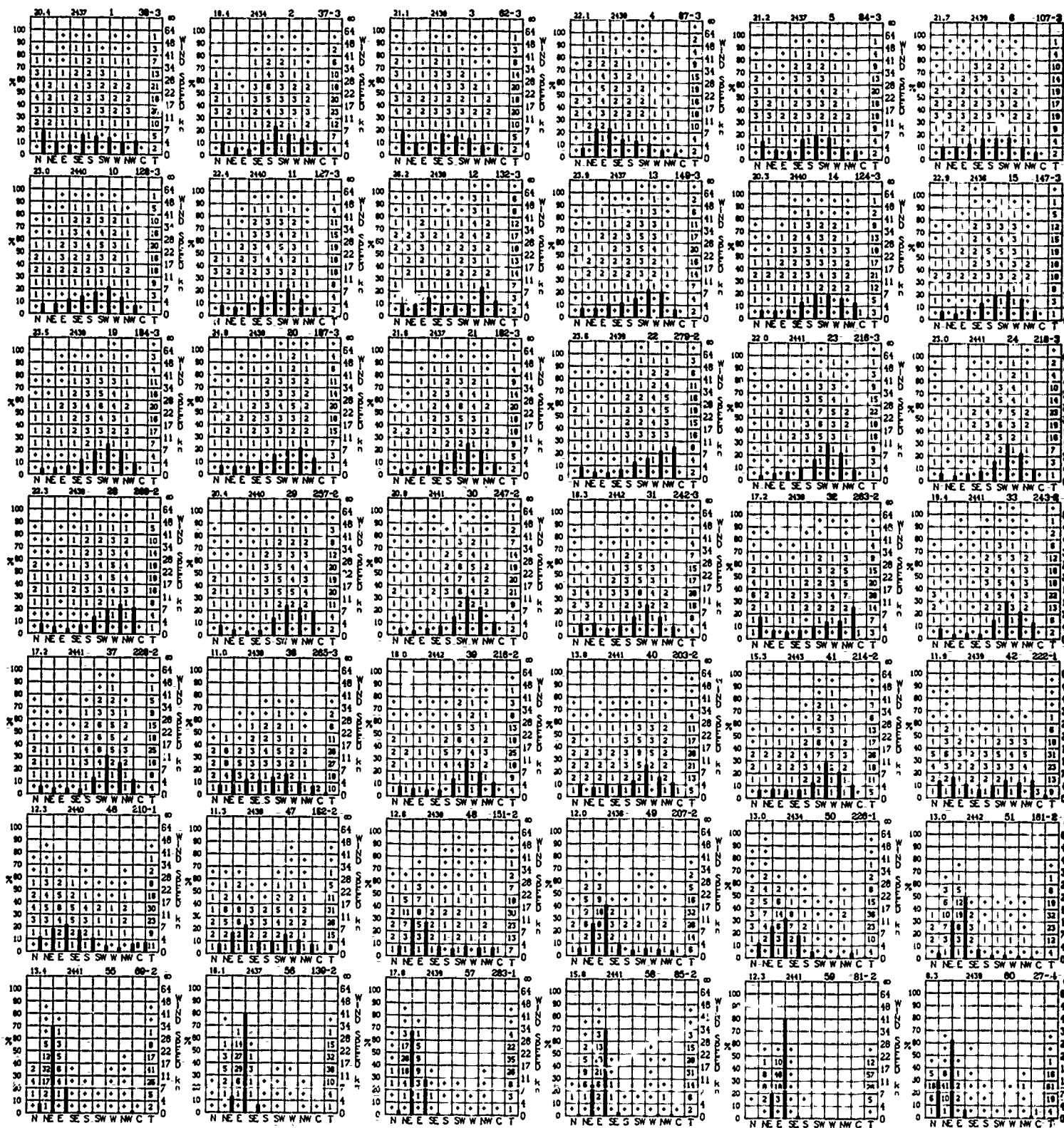
# WAVE



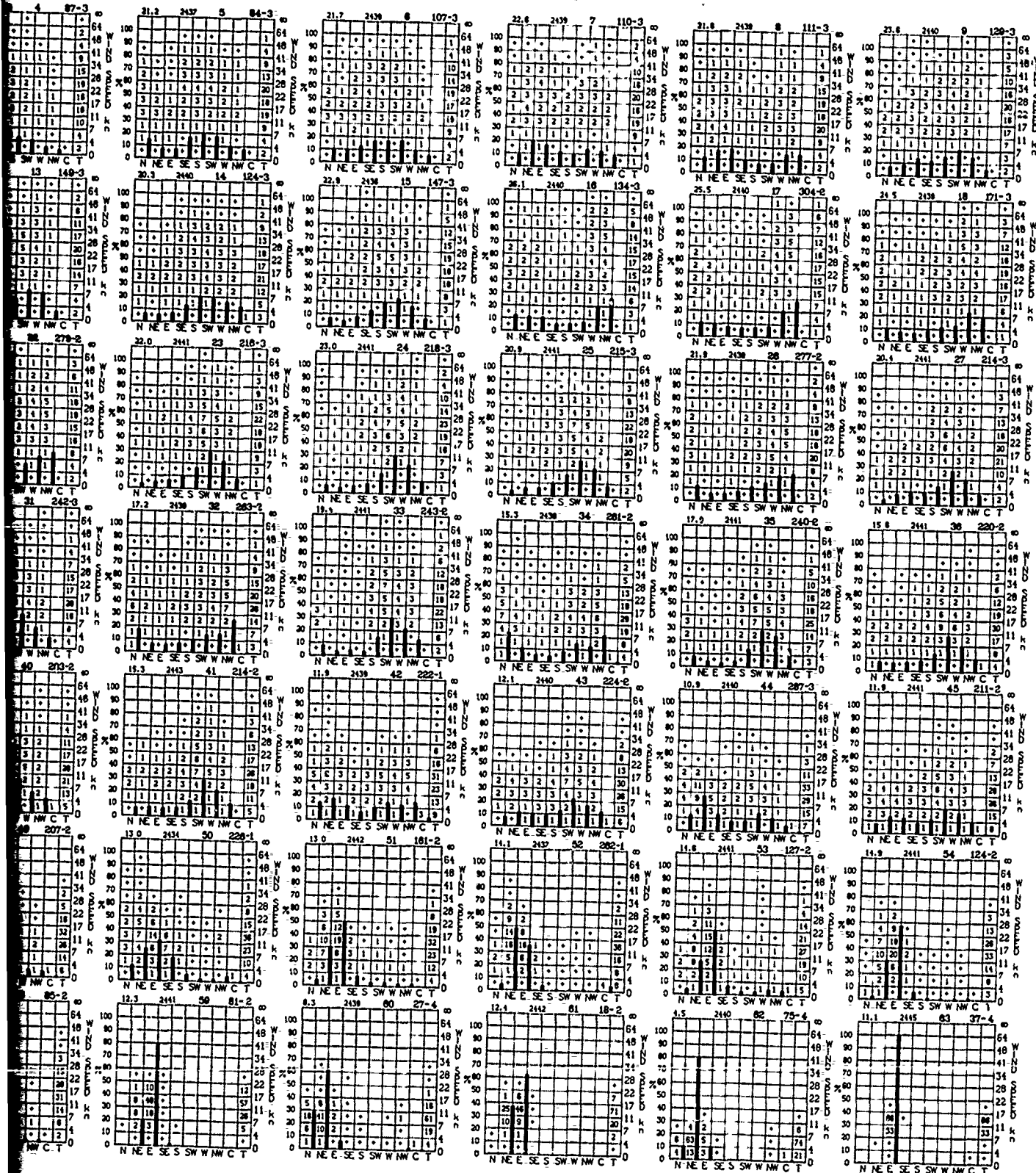
# WAVE SLOPE ( $\alpha$ ) ( $\leq 0.05$ AND $\geq 0.10$ )



# WIND DIRECTION AND SPEED

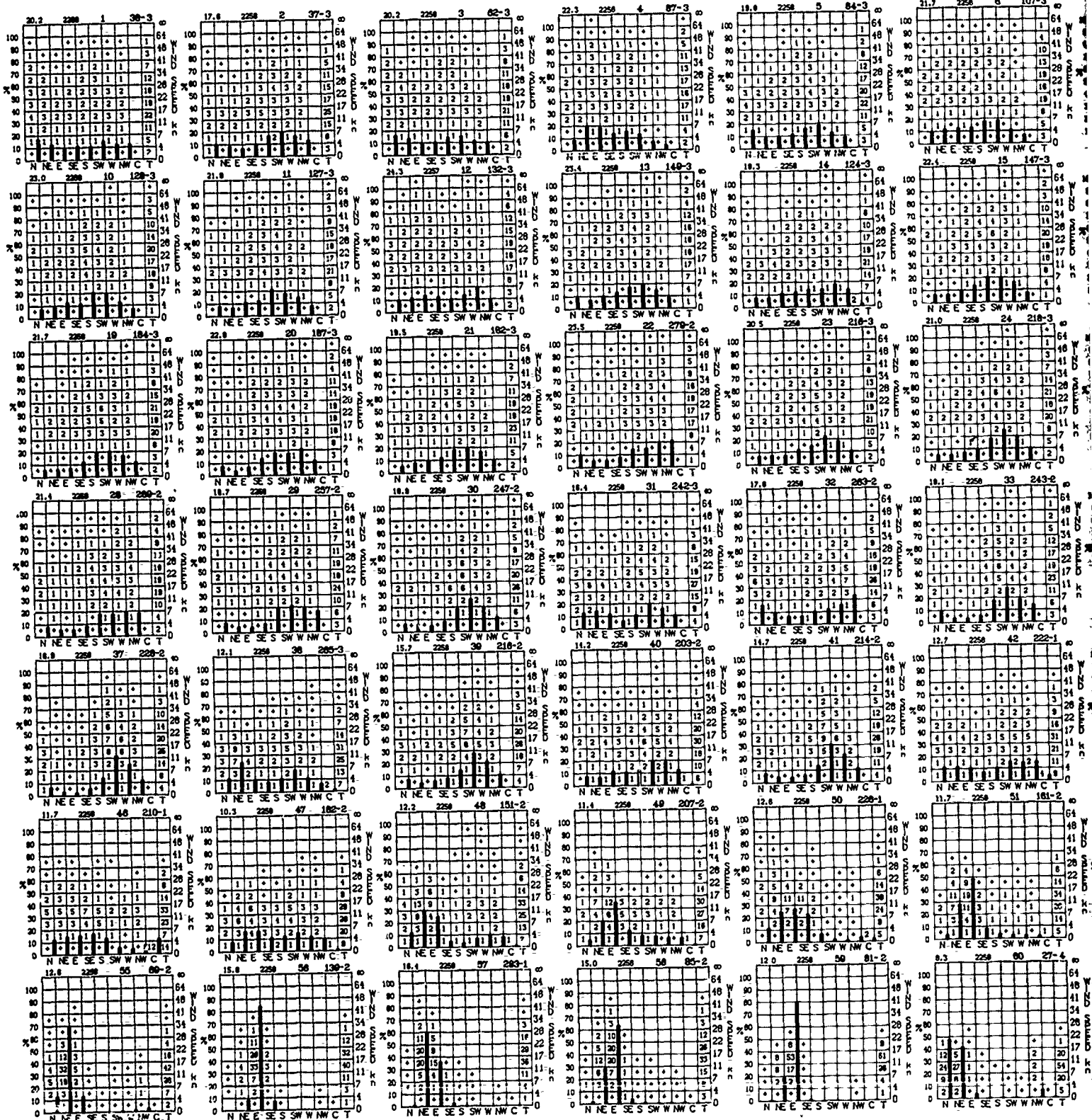


# JANUARY



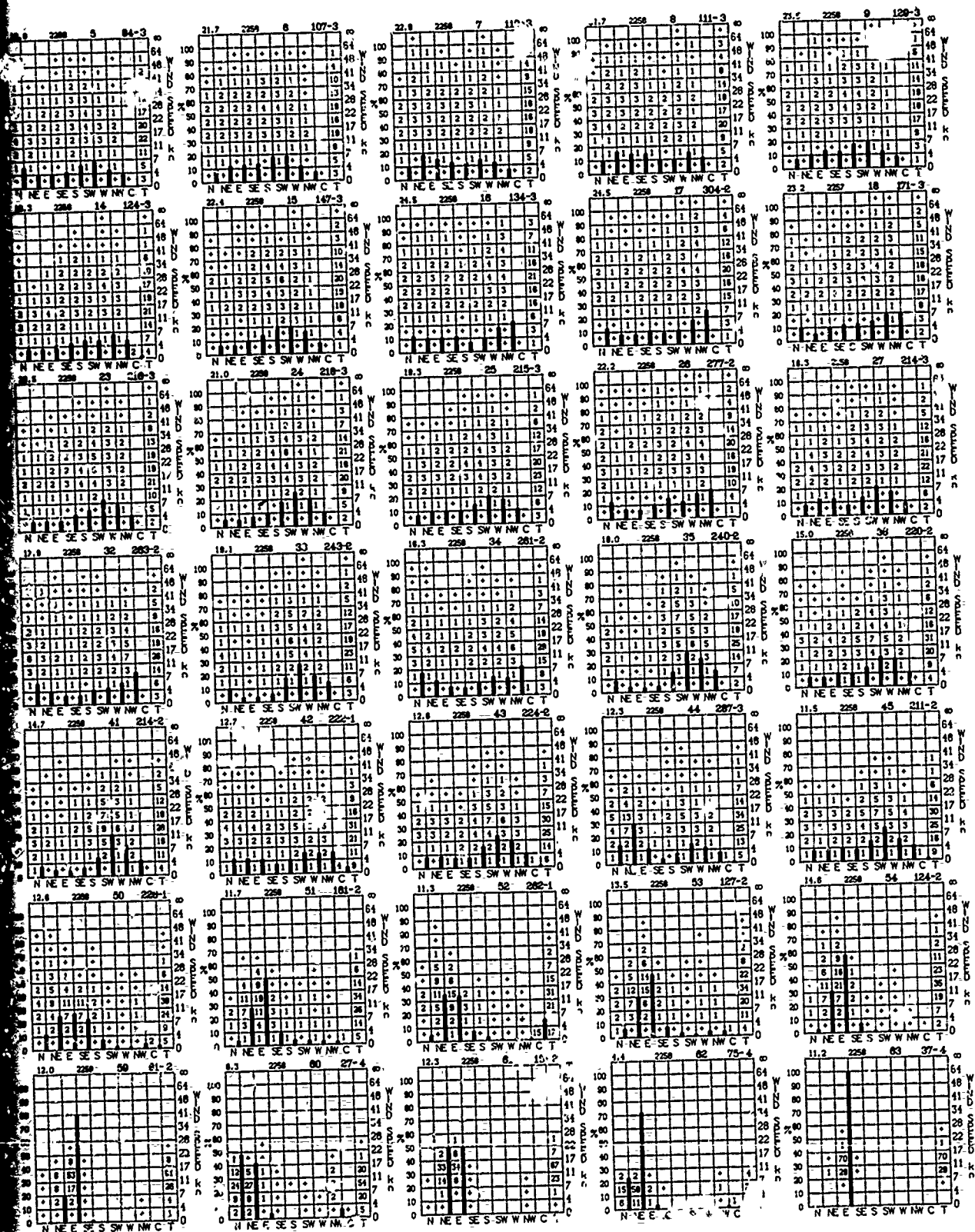


# FEBRUARY

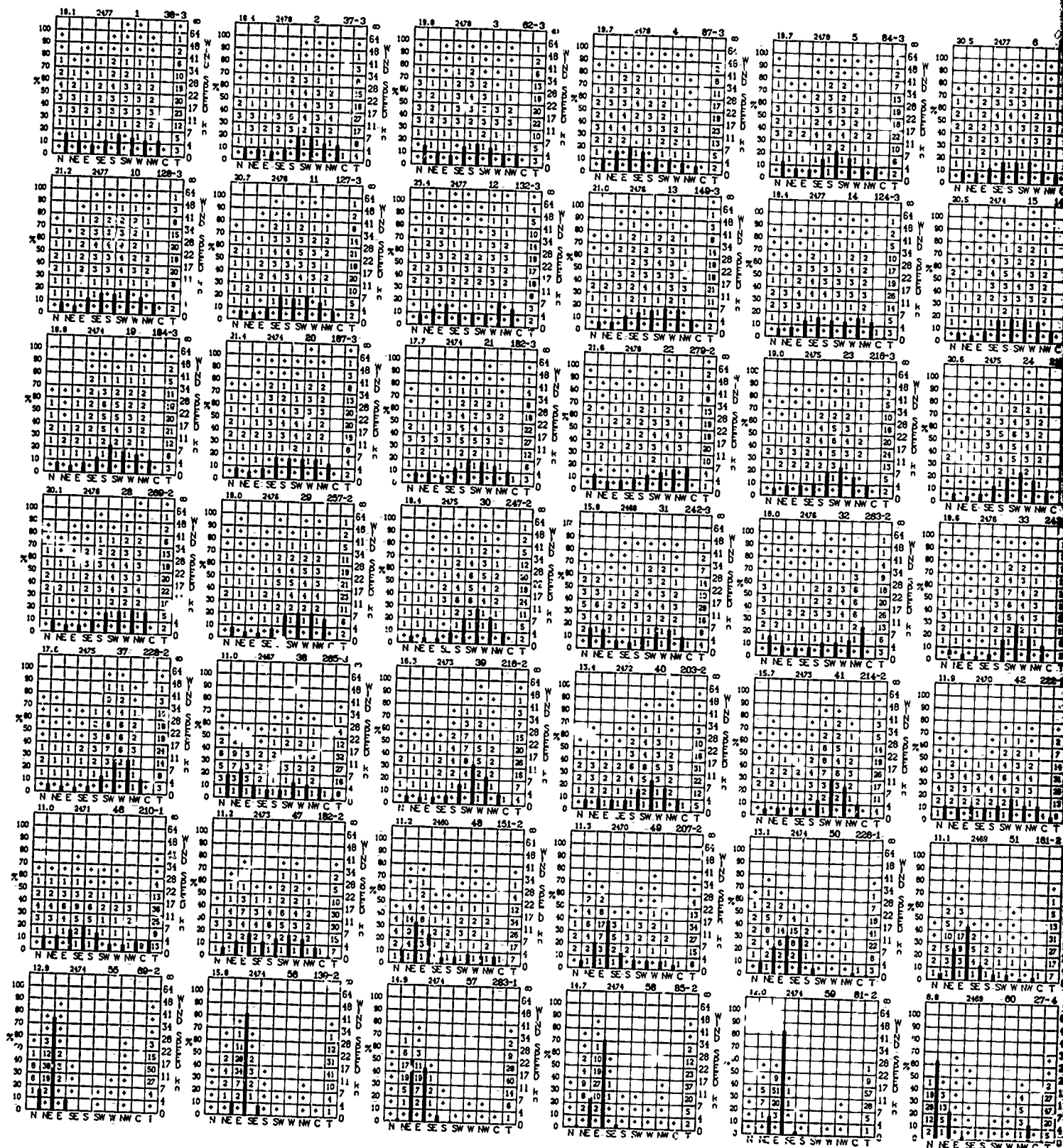




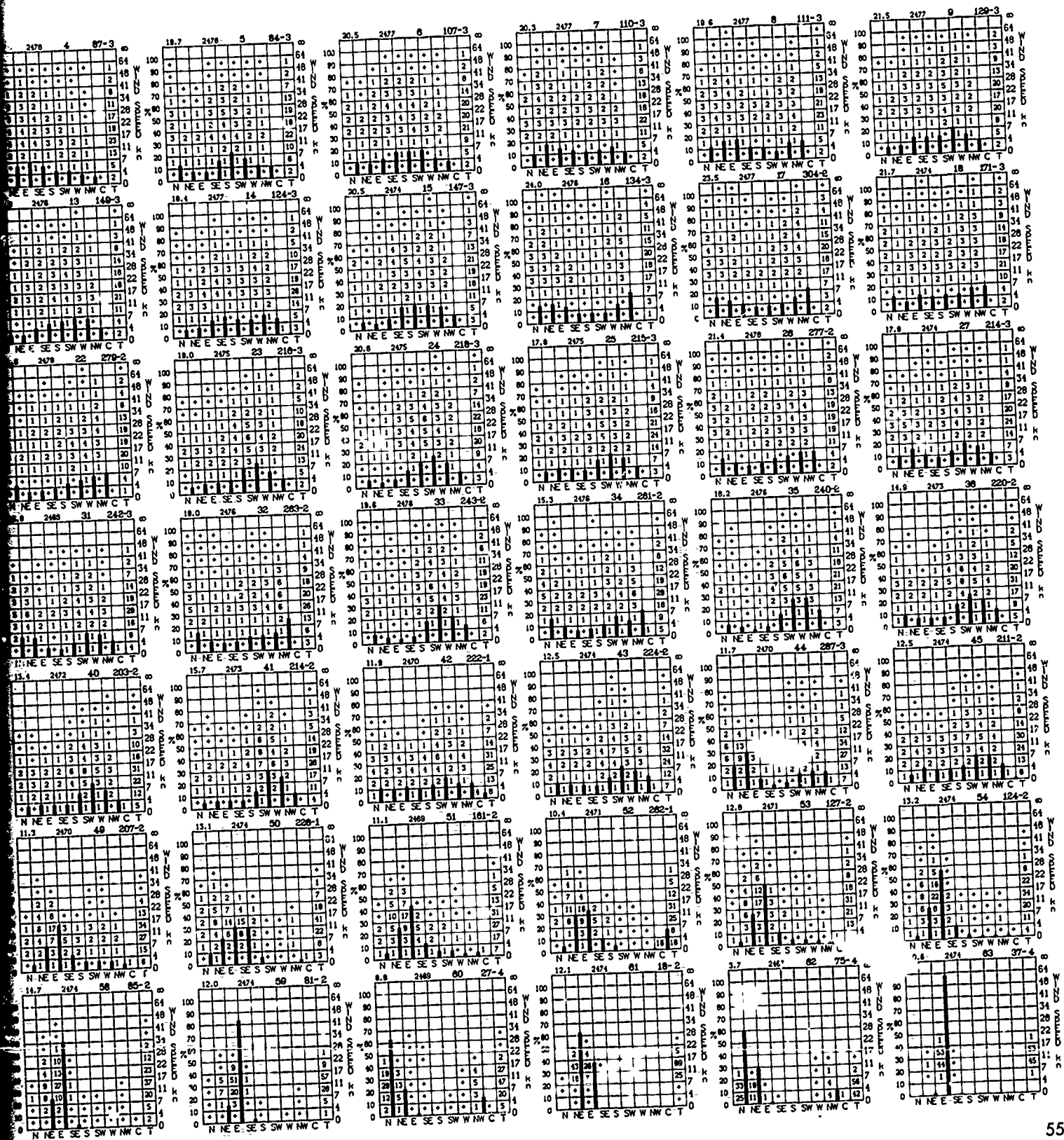
# WIND DIRECTION AND SPEED



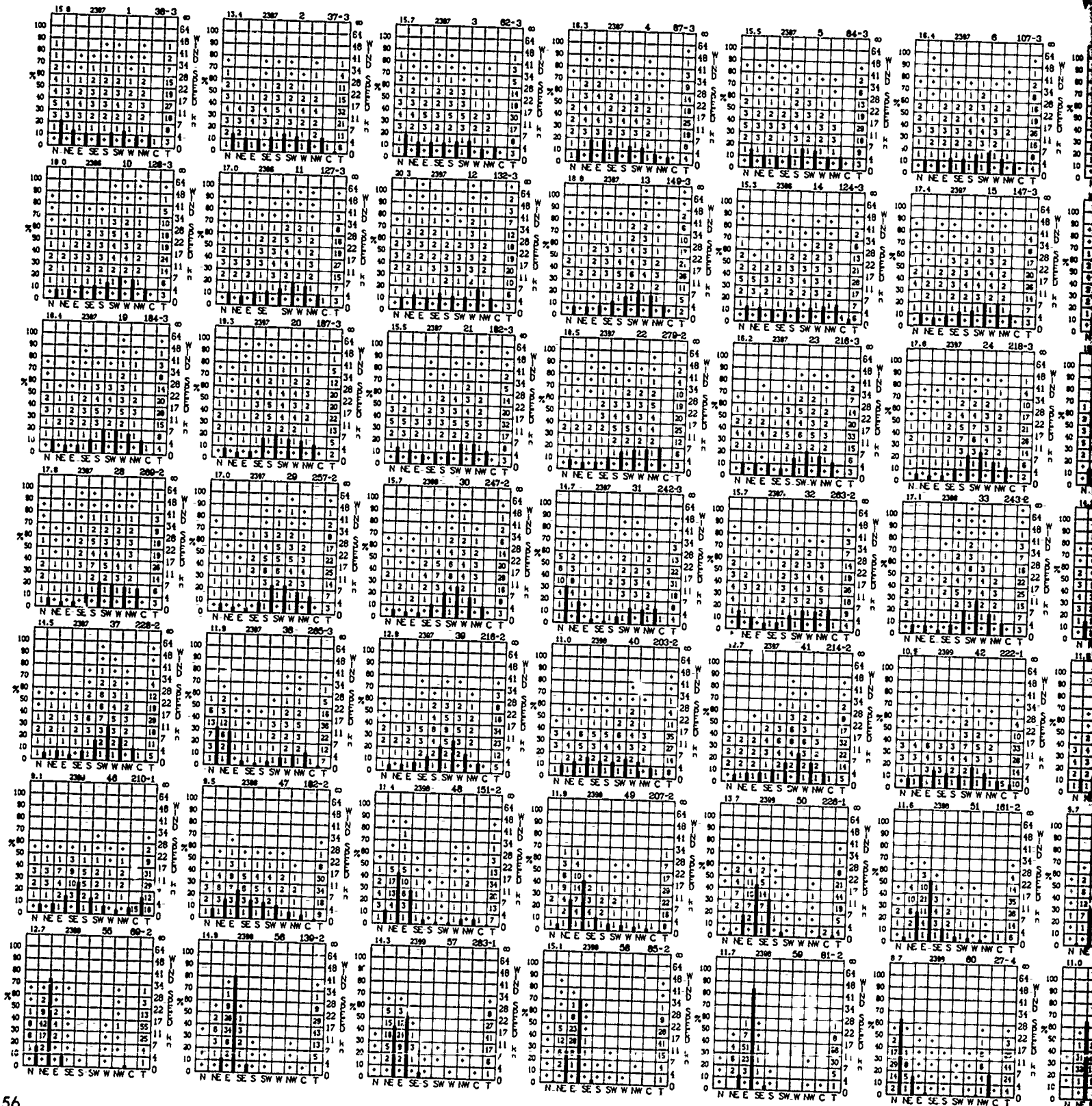
# WIND DIRECTION AND SPEED



# MARCH

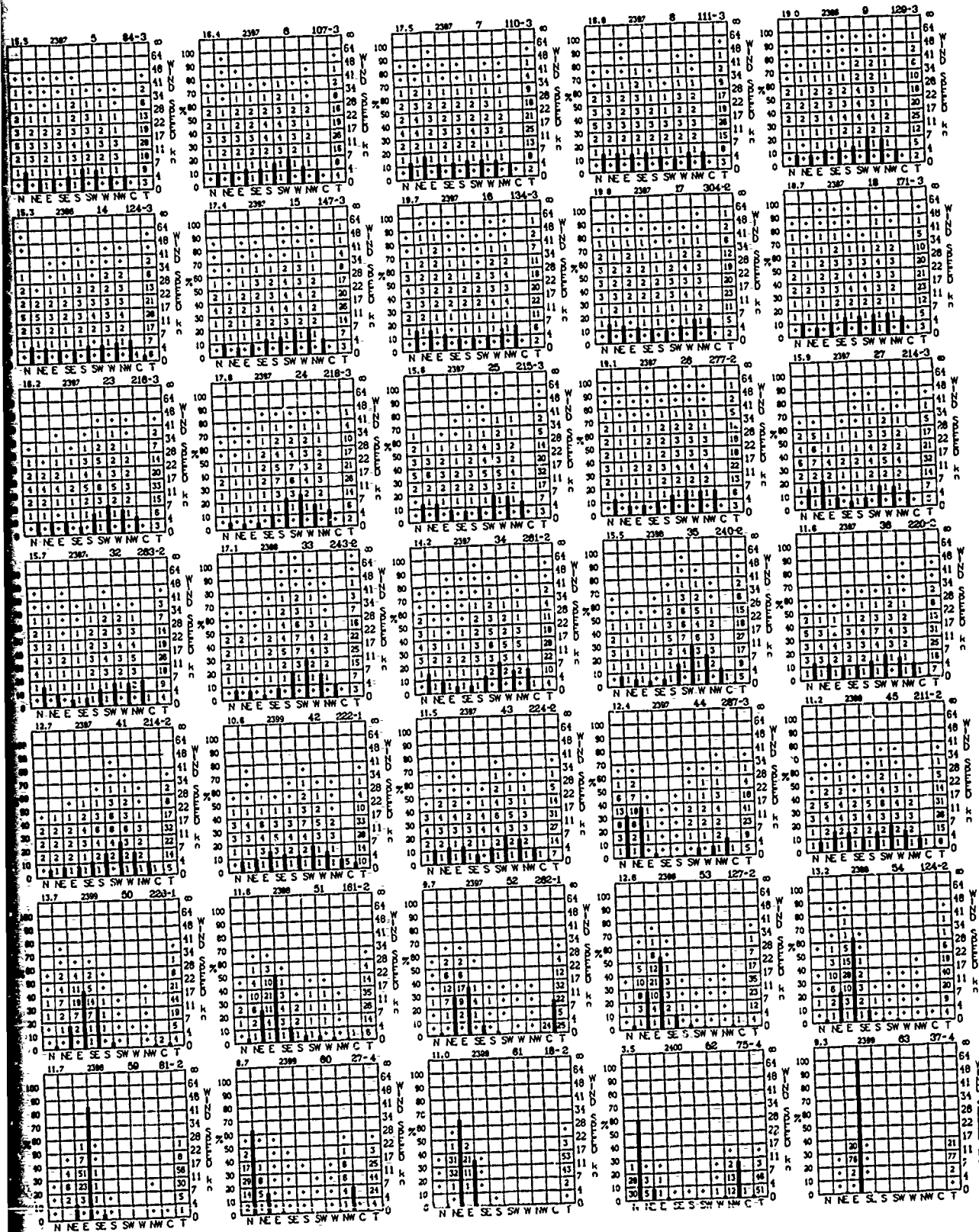


# APRIL

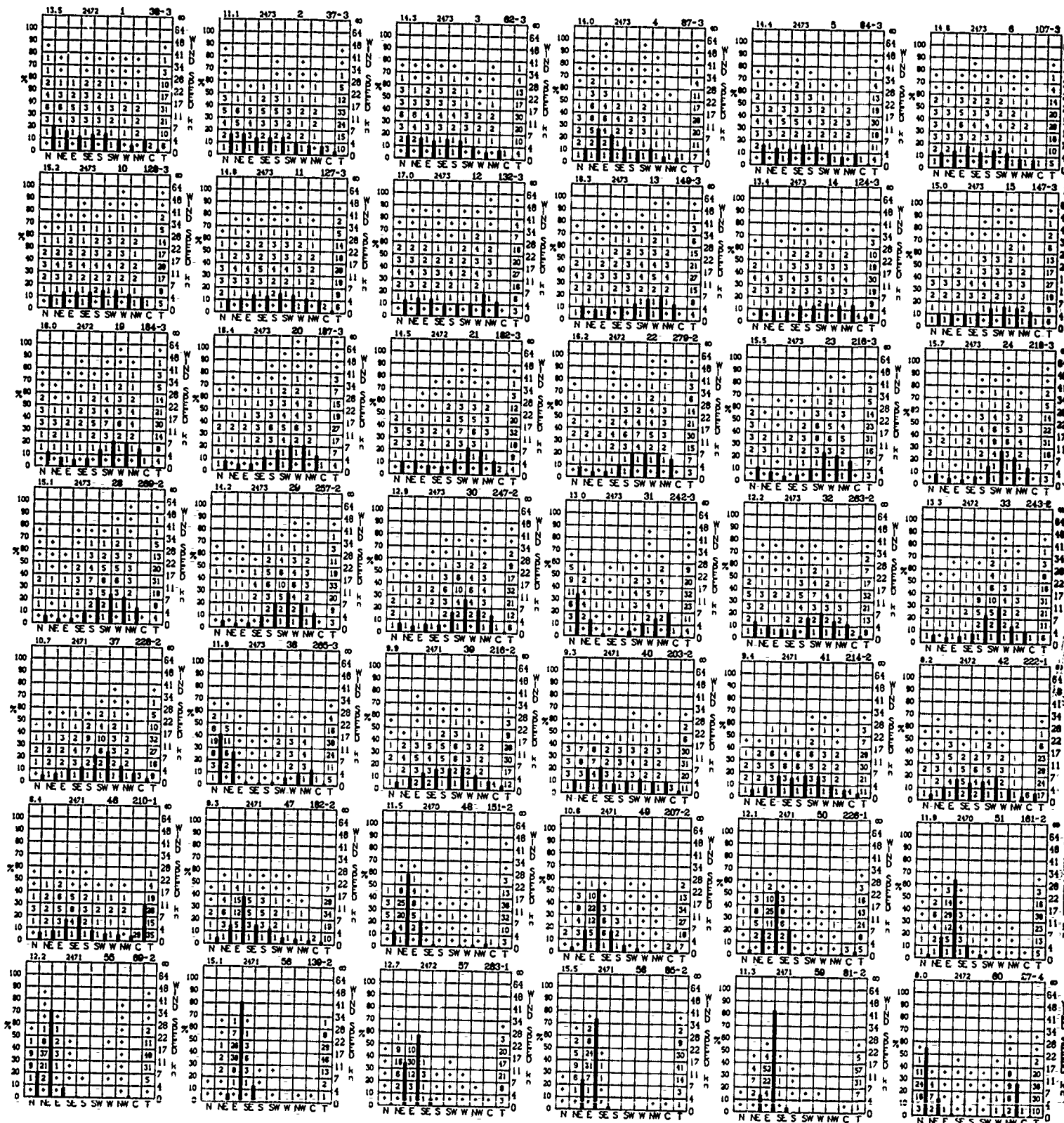




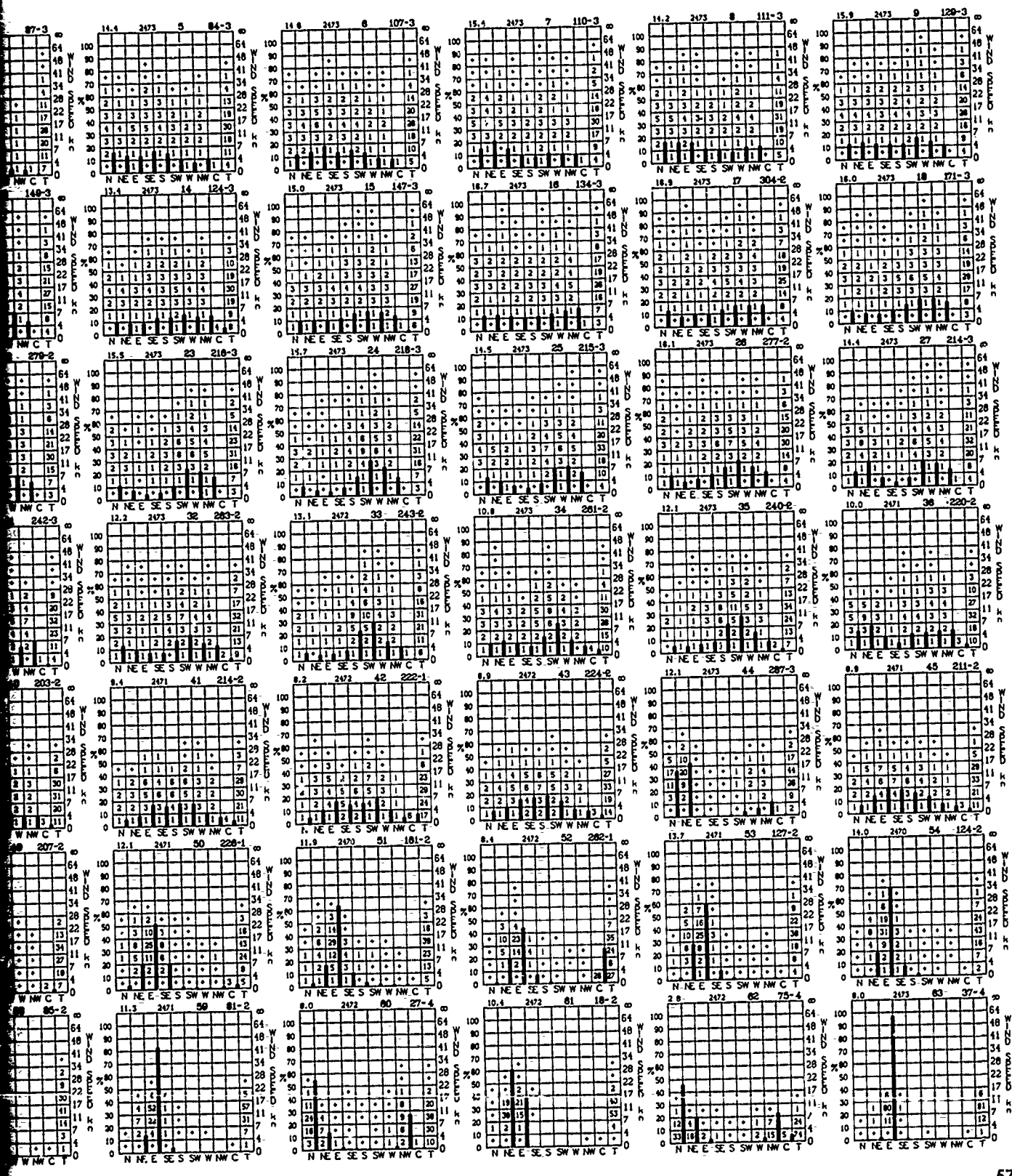
# WIND DIRECTION AND SPEED



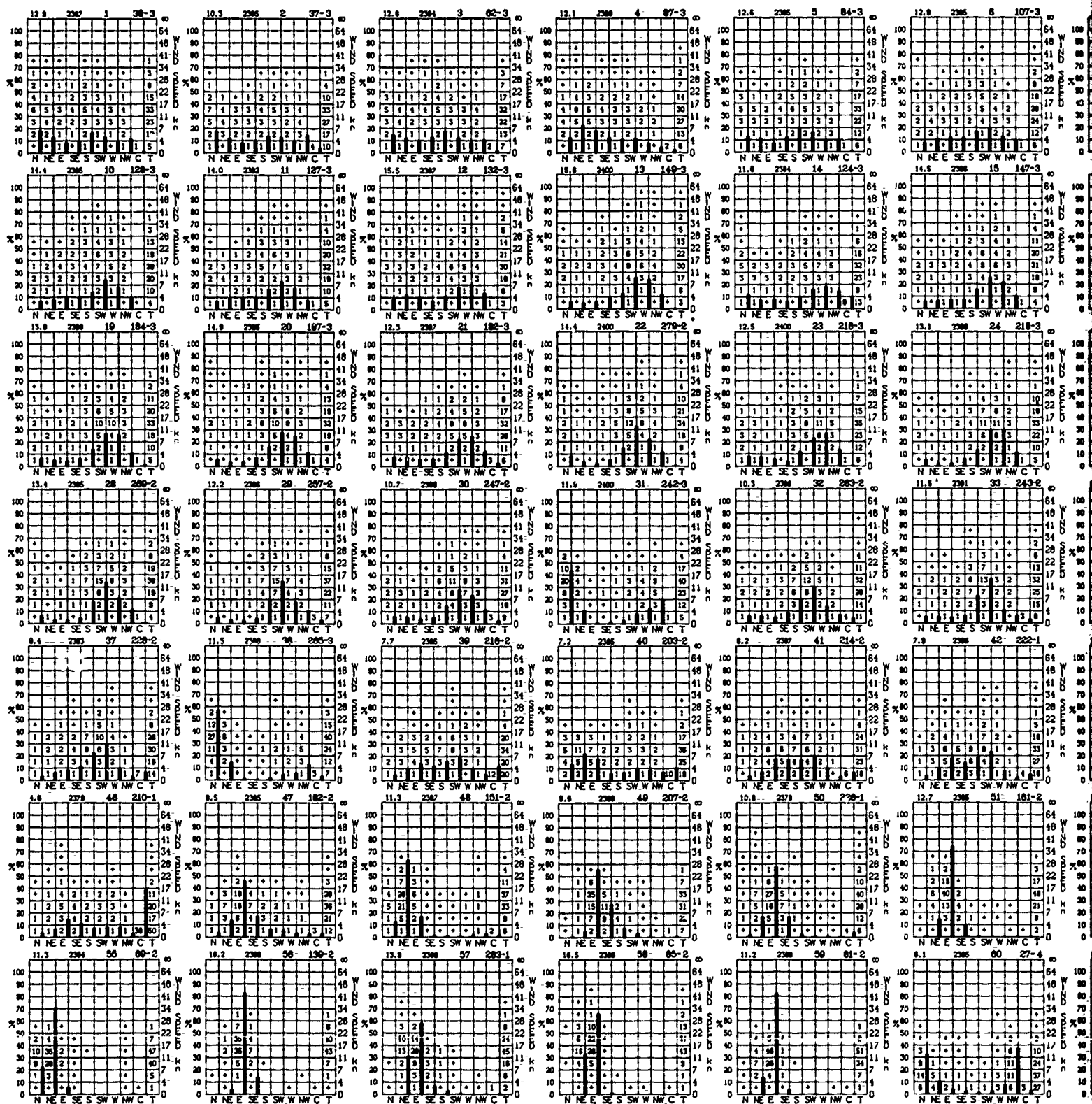
# WIND DIRECTION AND SPEED



# MAY

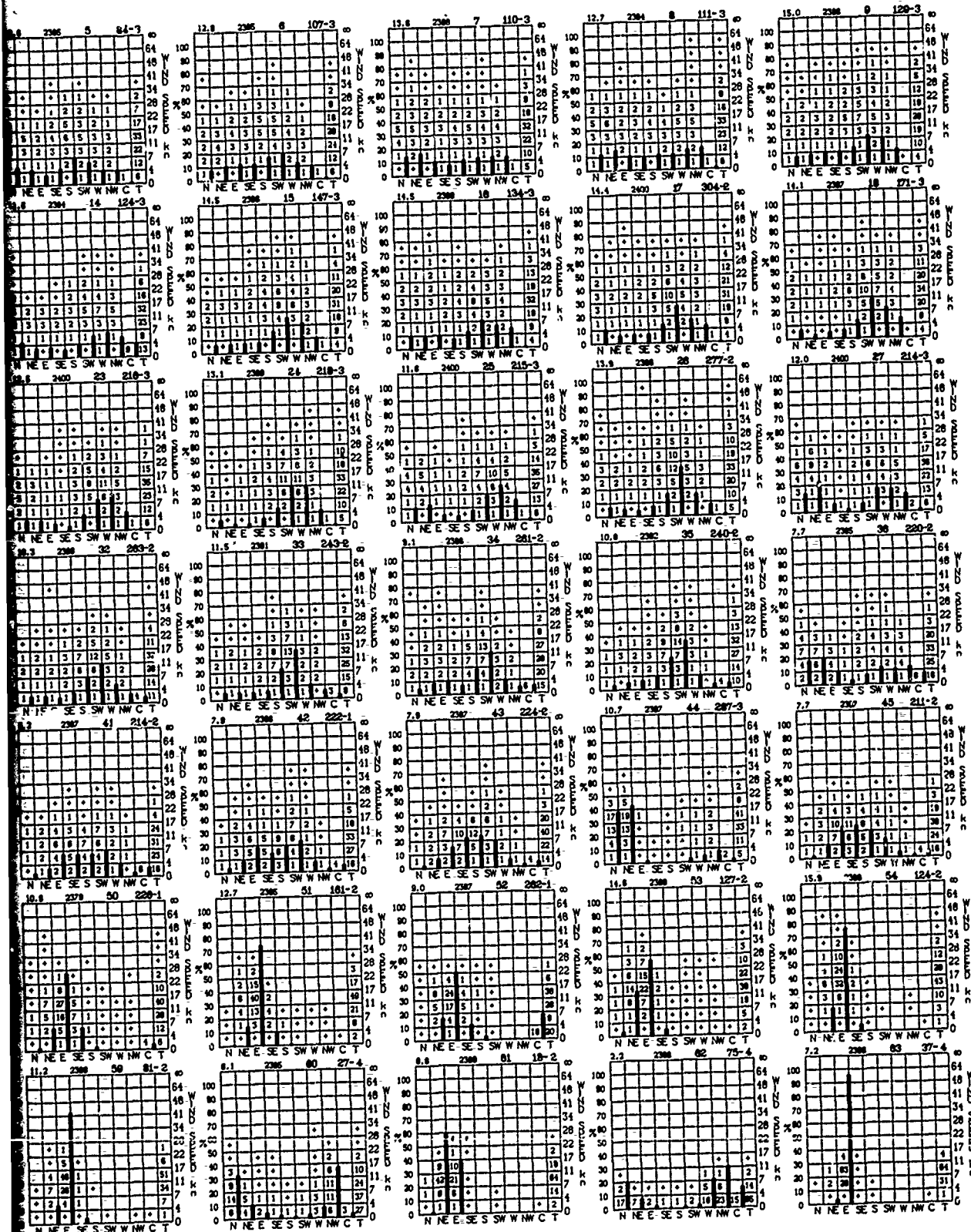


# JUNE

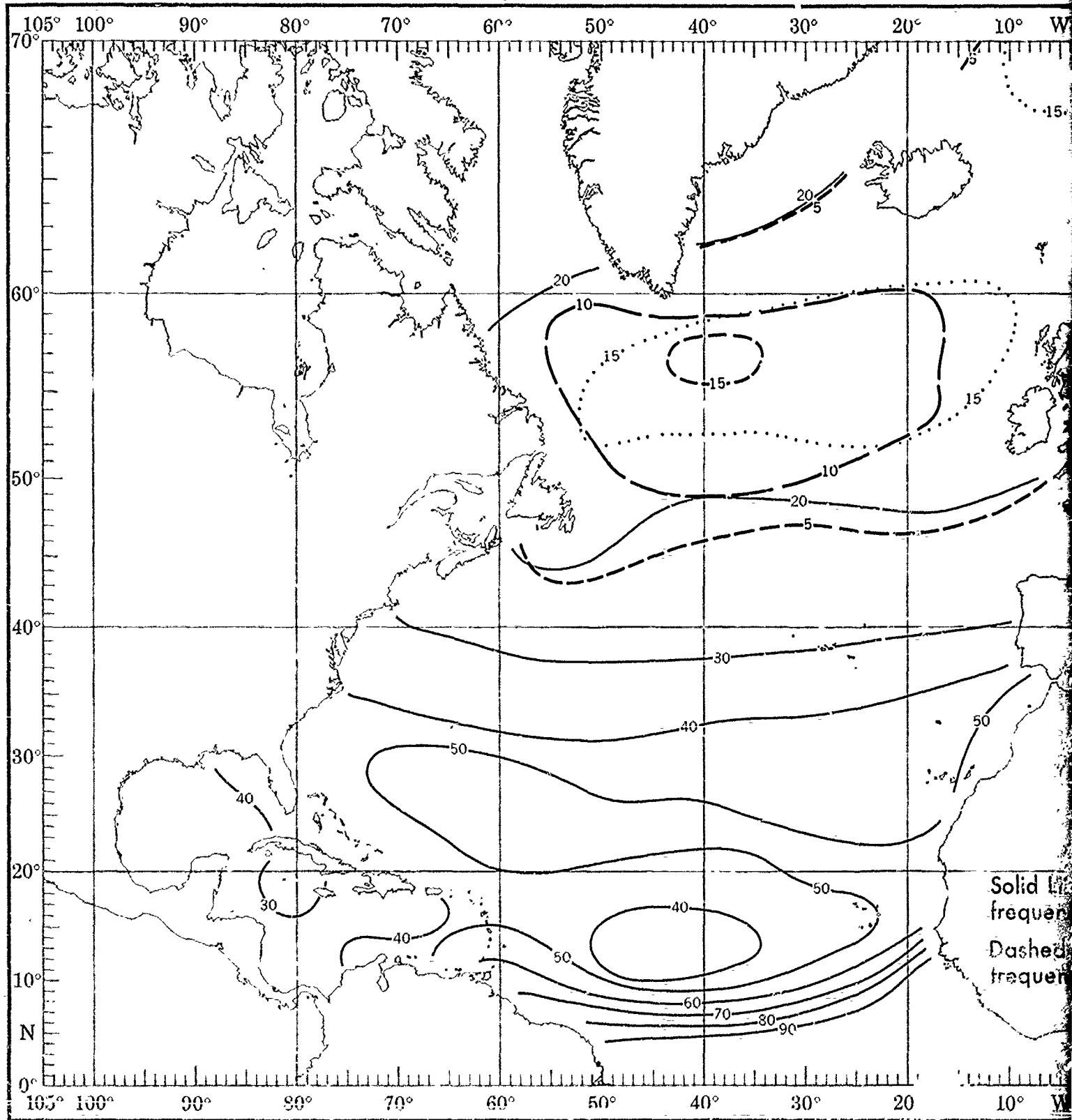




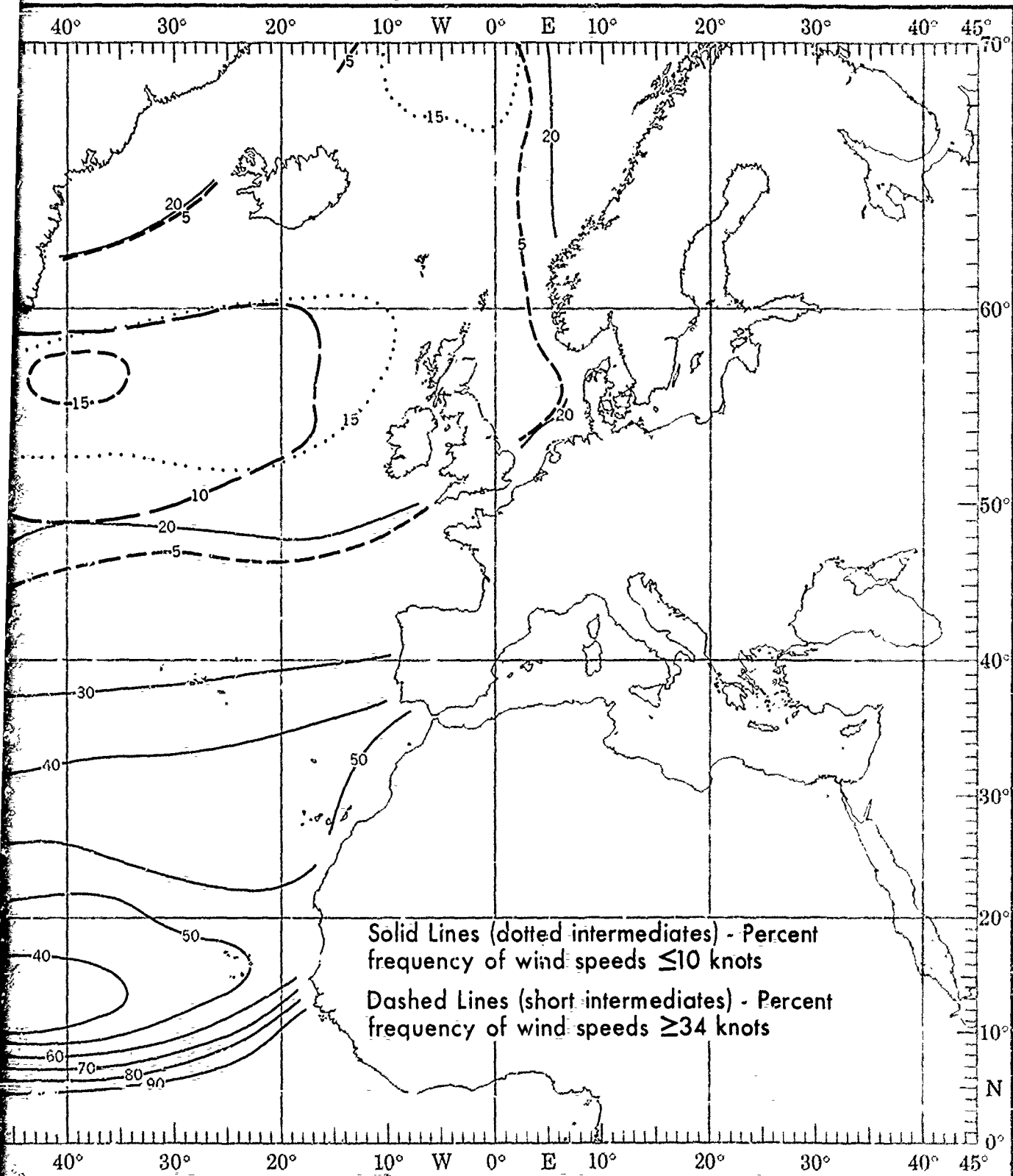
# WIND DIRECTION AND SPEED



# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)

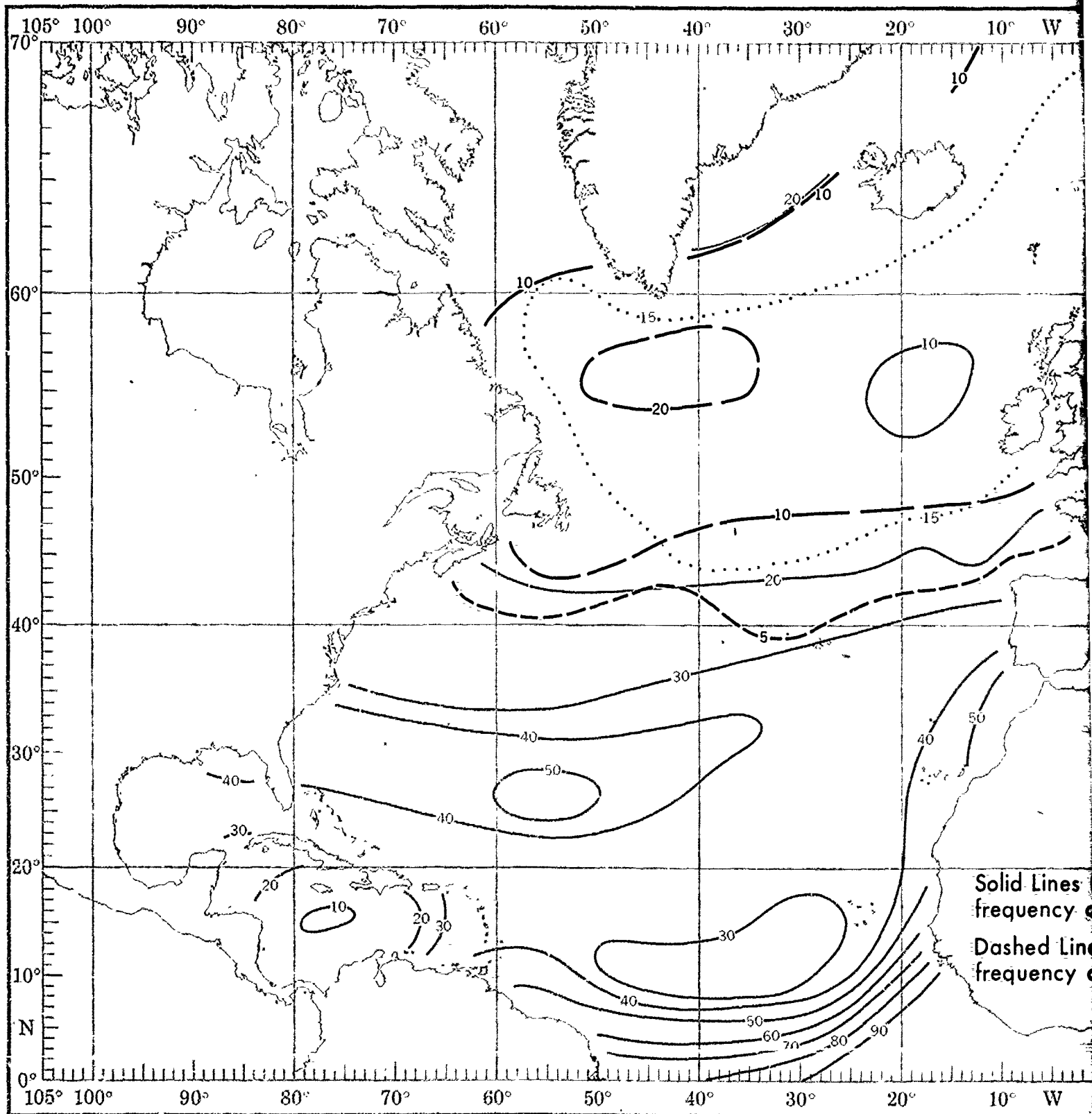


# NOVEMBER

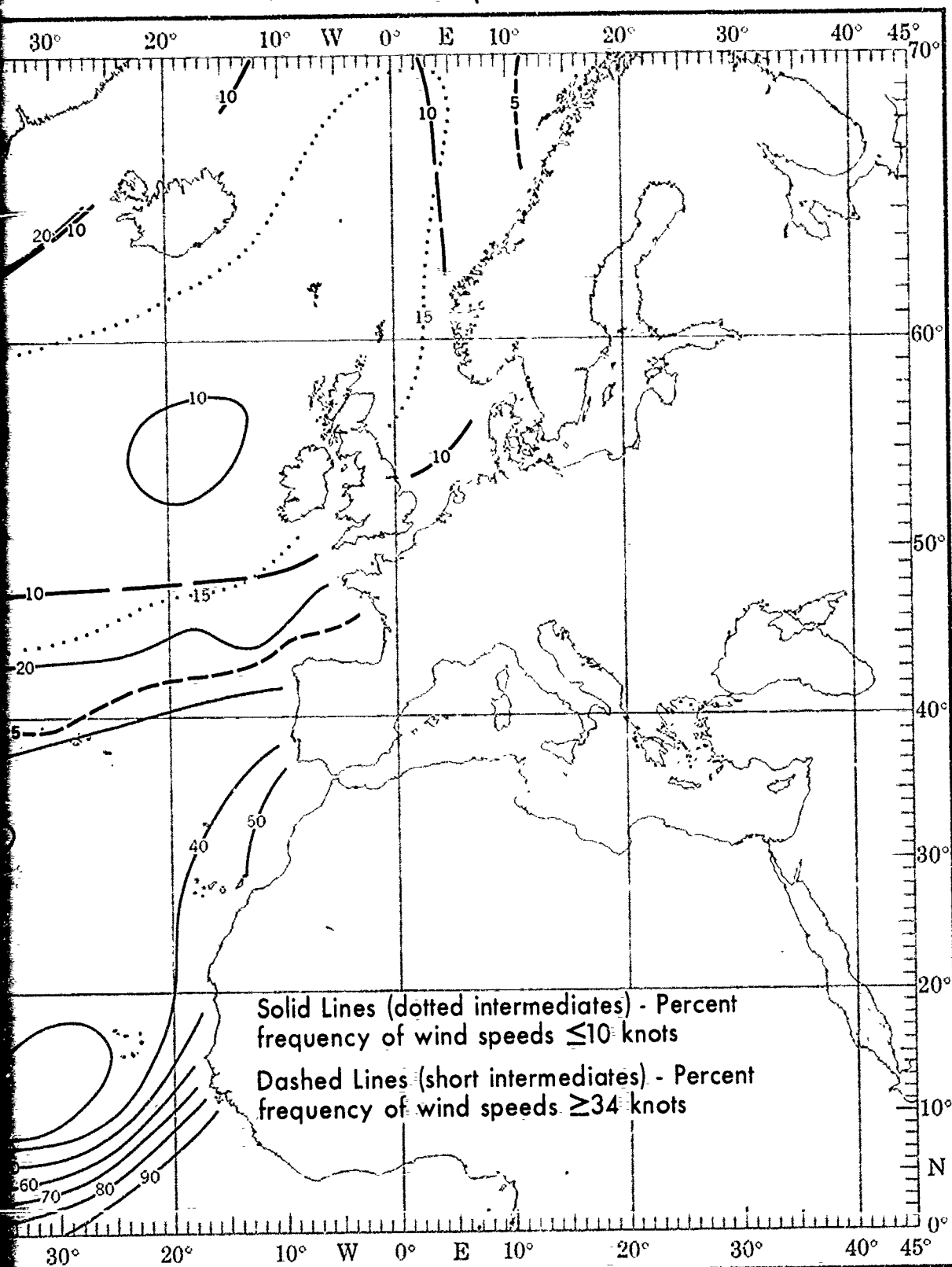


DECEMBER

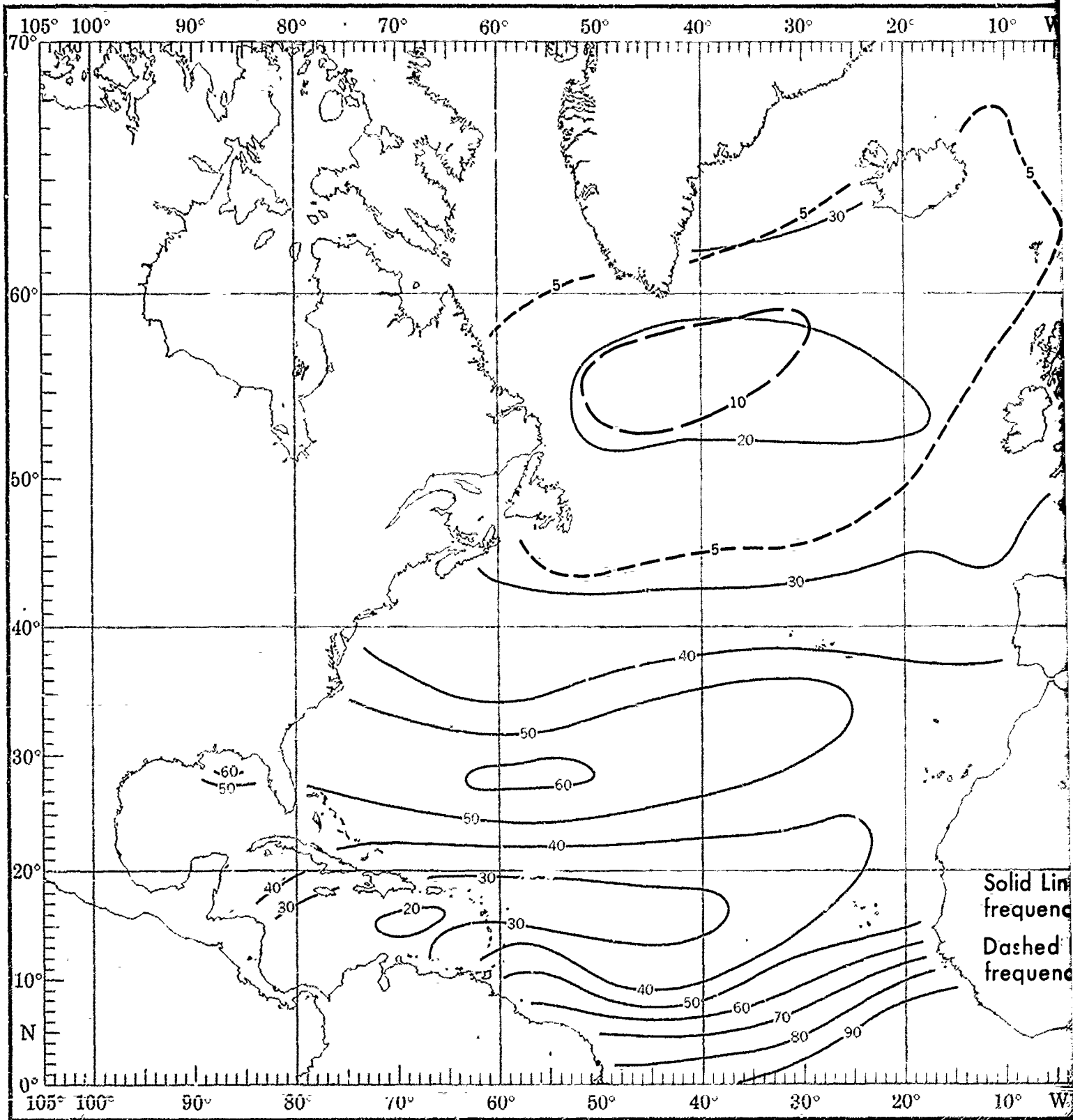
WIND



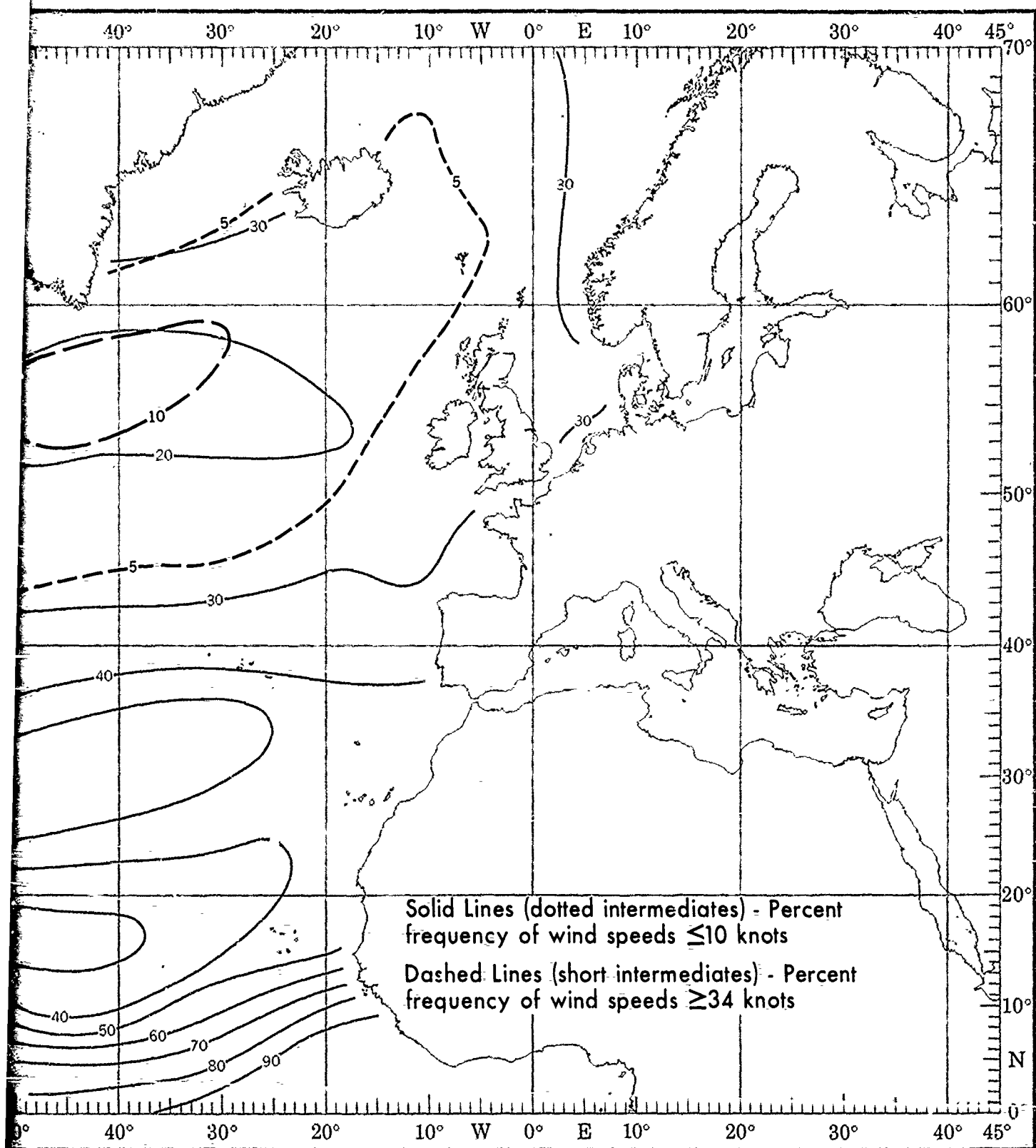
# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)



# WIND SPEED ( $\leq 10$ AND $\geq 34$ KNOTS)

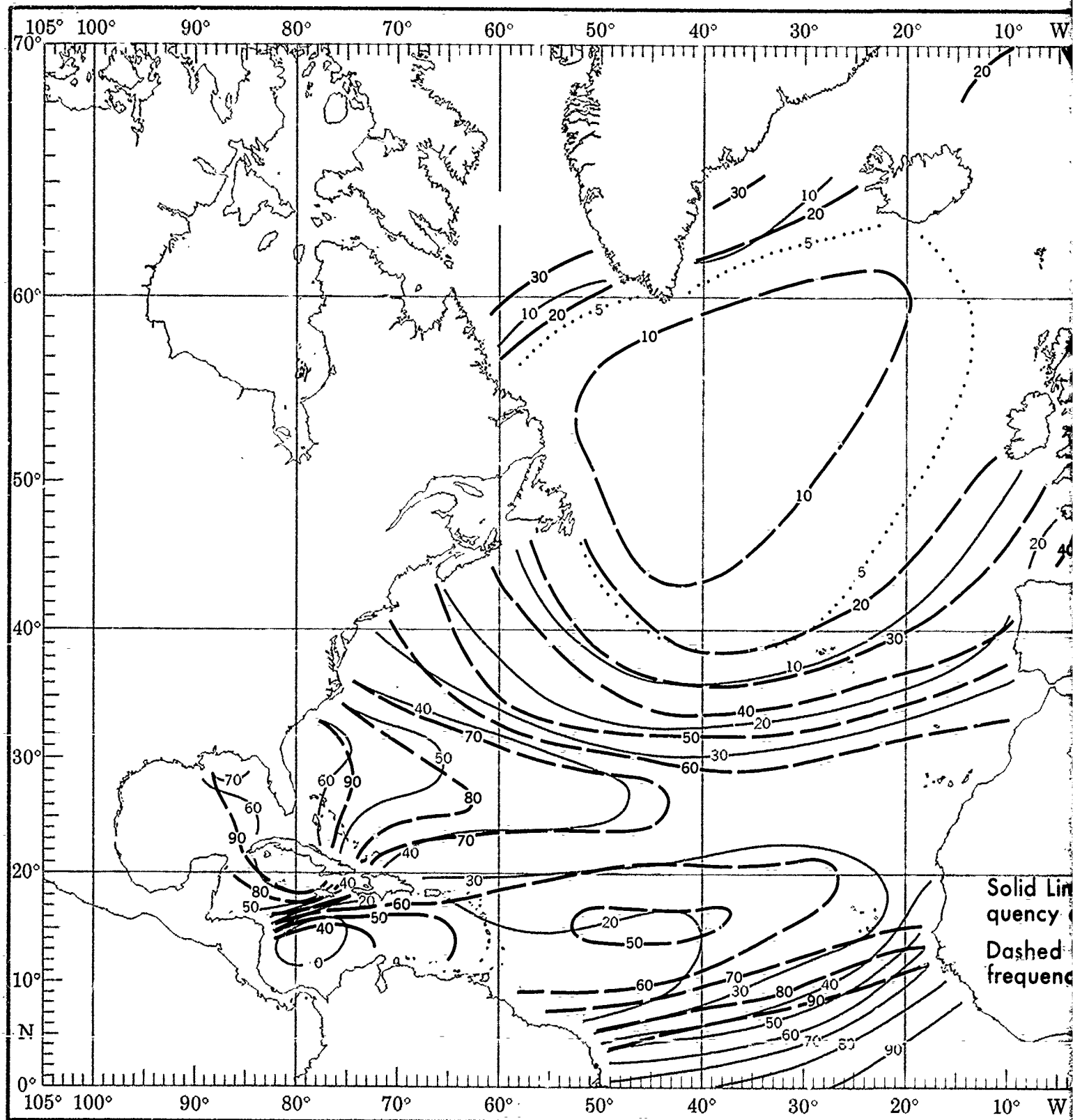


# ANNUAL



# JANUARY

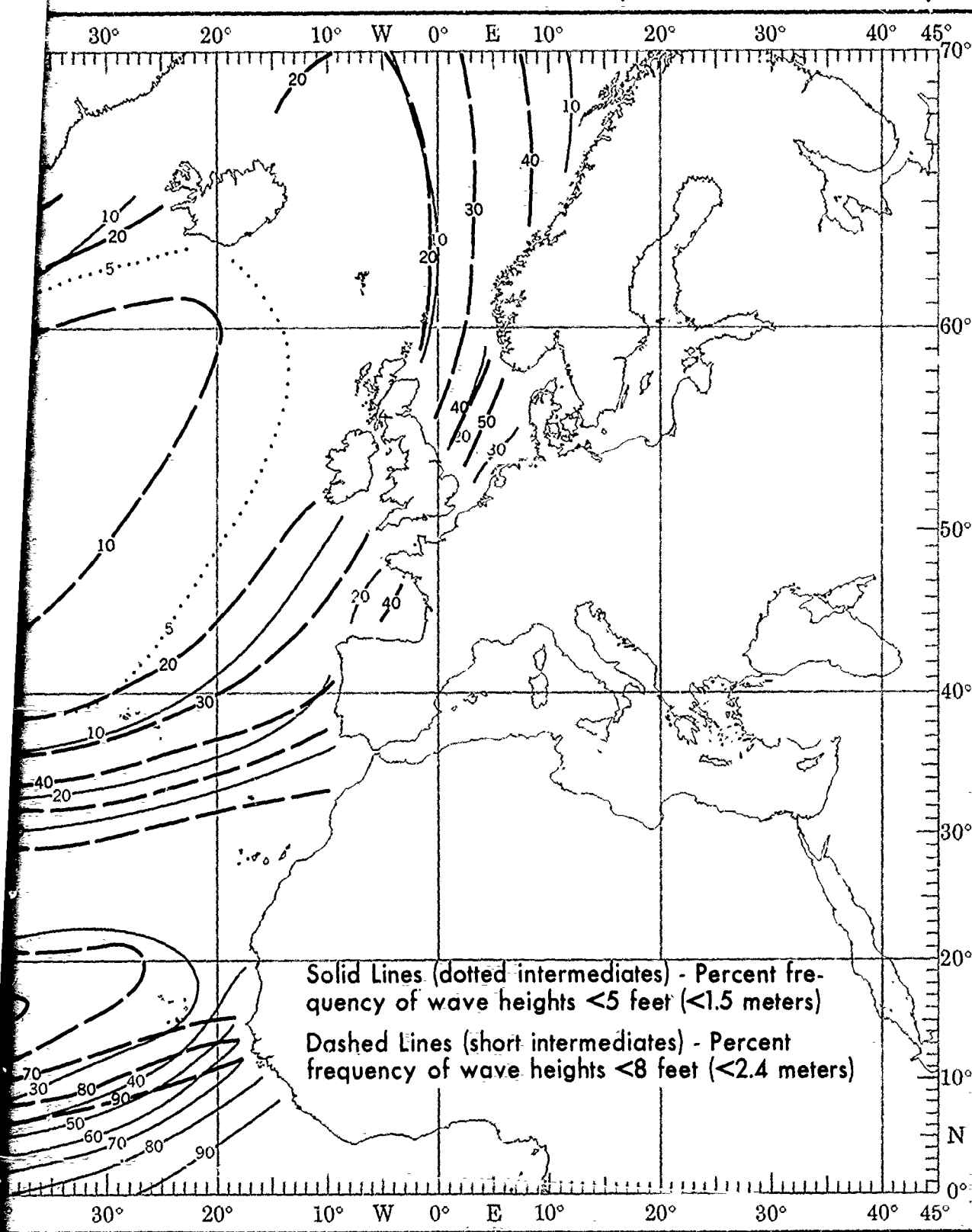
WA



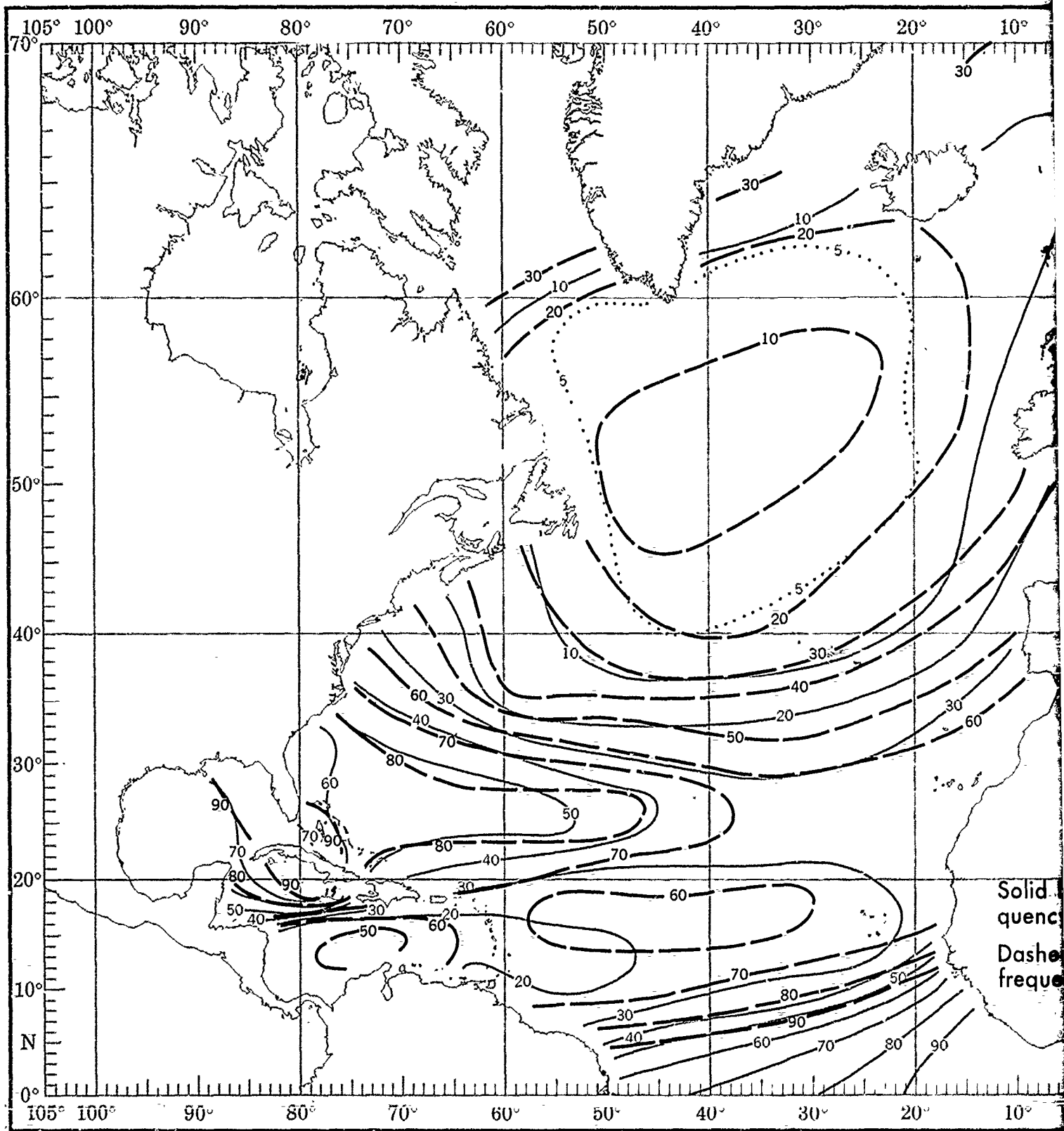
Solid Lin  
quency  
Dashed  
frequen



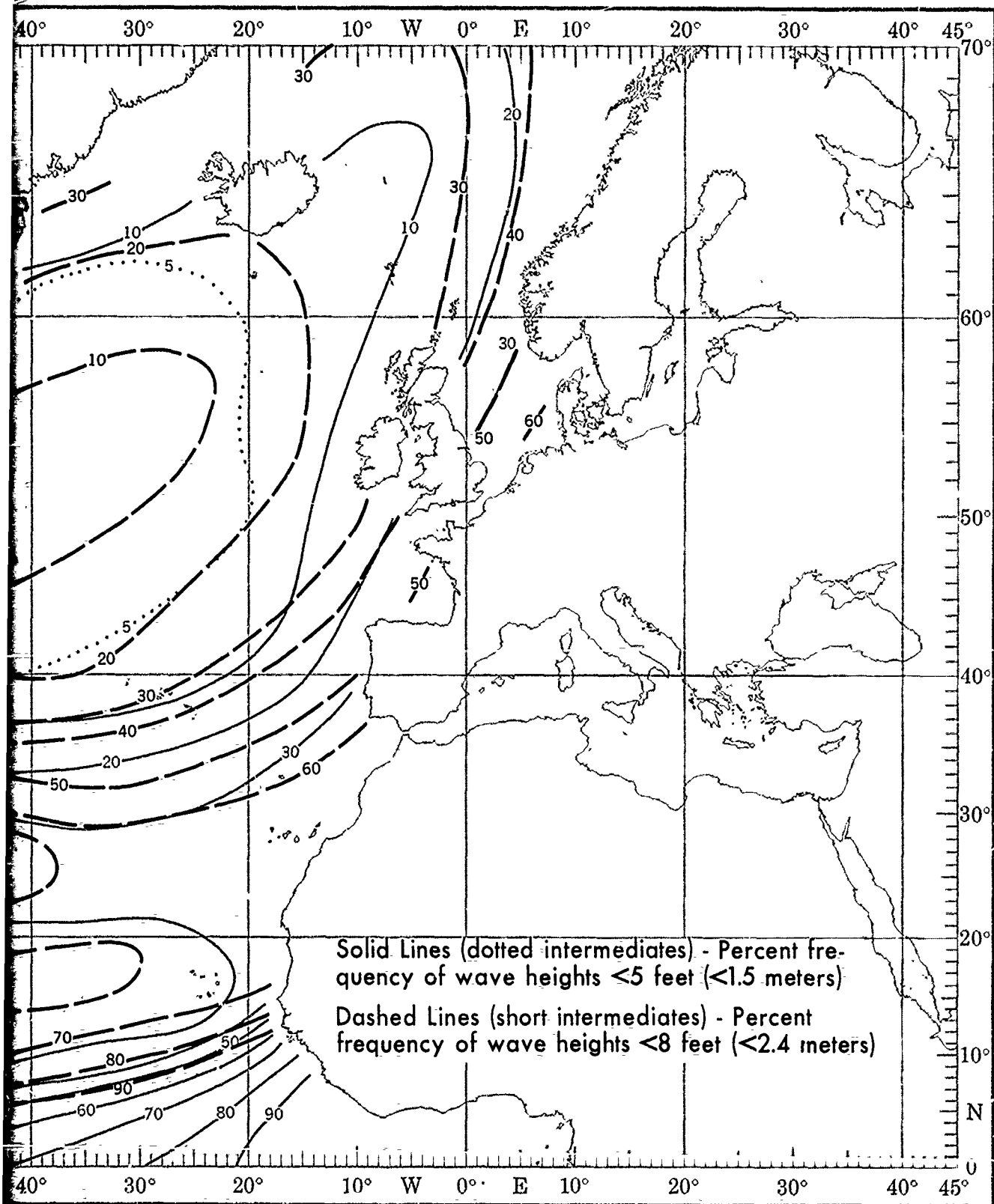
# WAVE HEIGHT (<5 AND <8 FEET)



# WAVE HEIGHT (<5 AND <8 FEET)

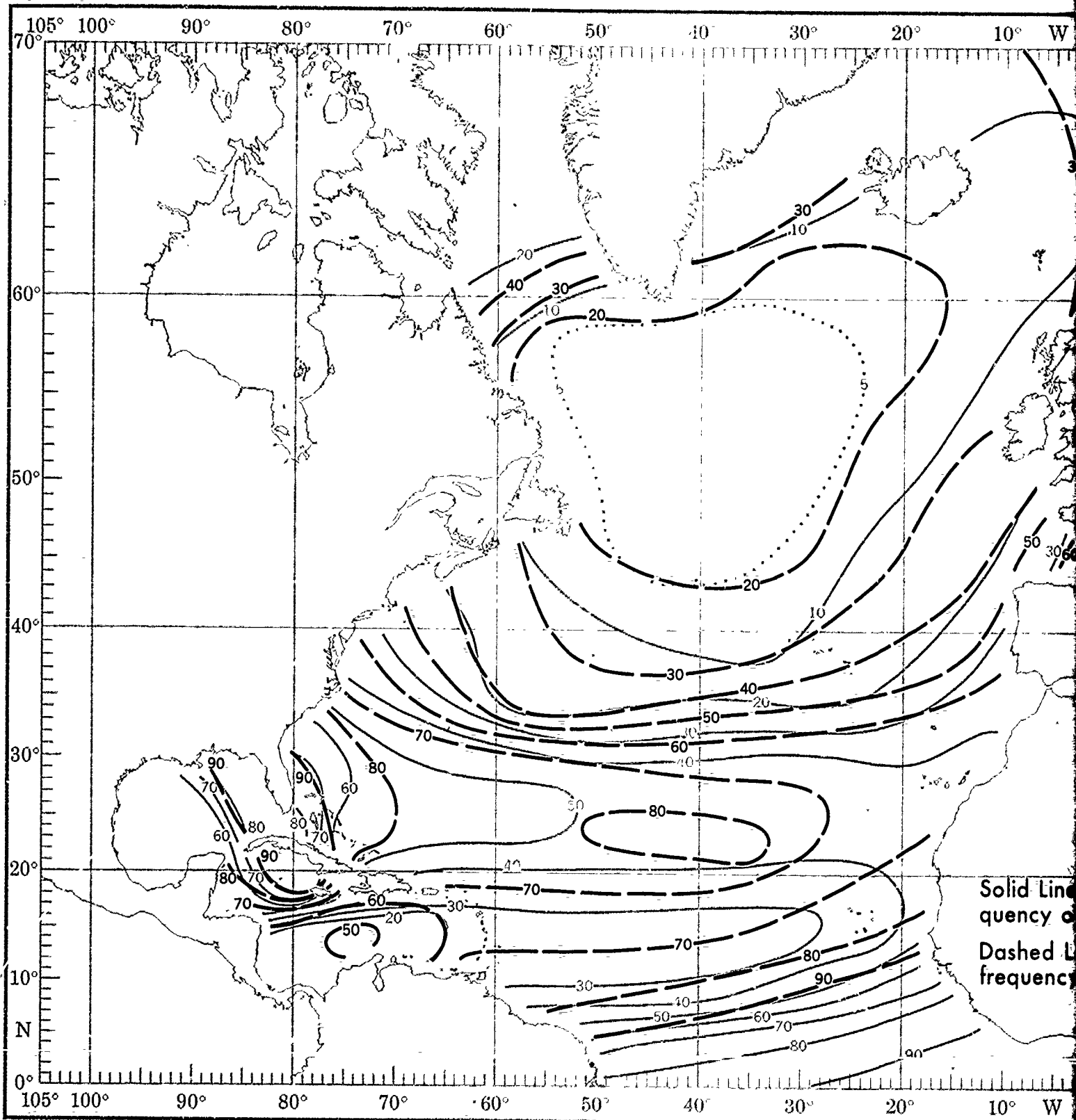


# FEBRUARY



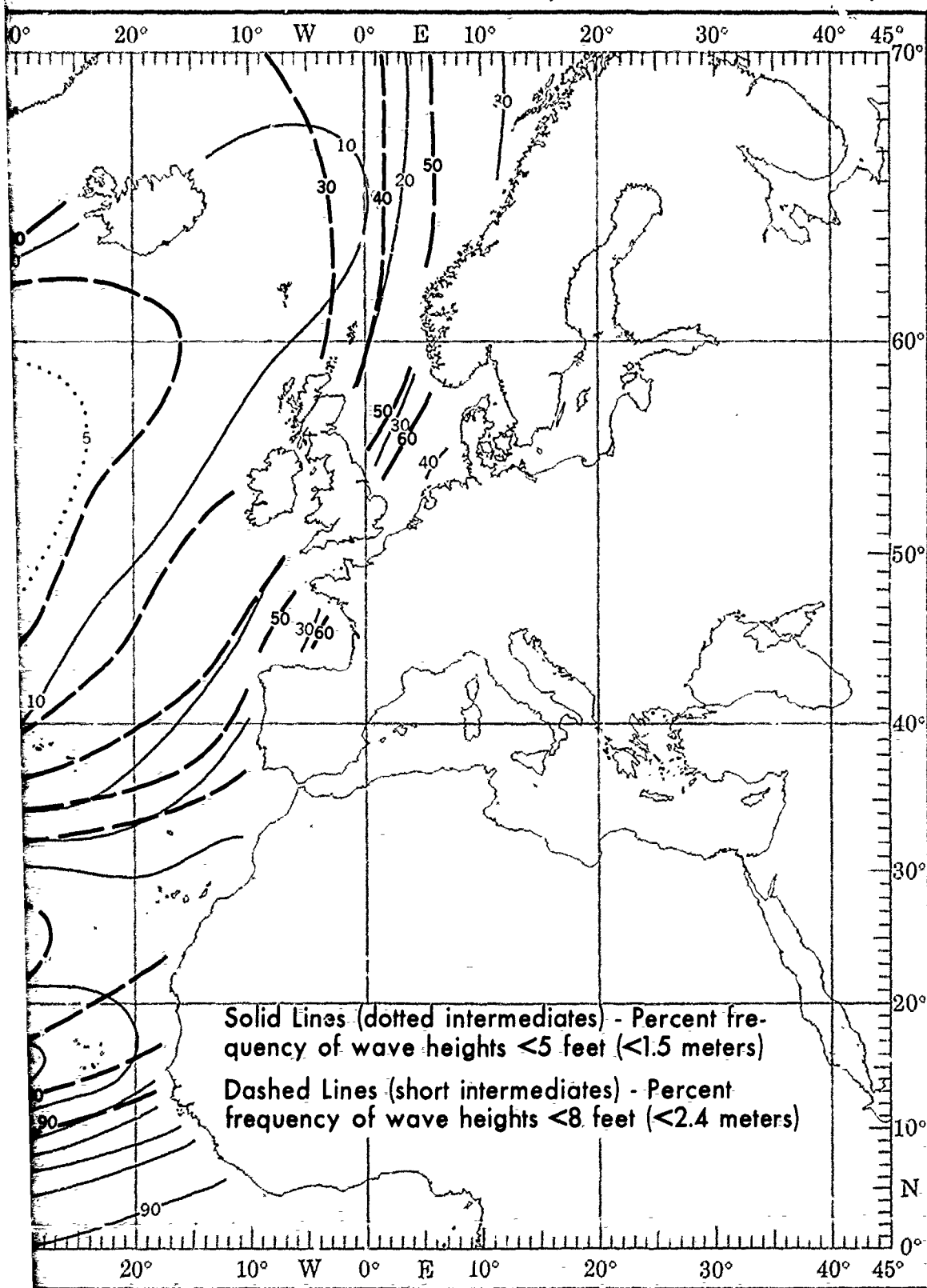
# MARCH

# WA

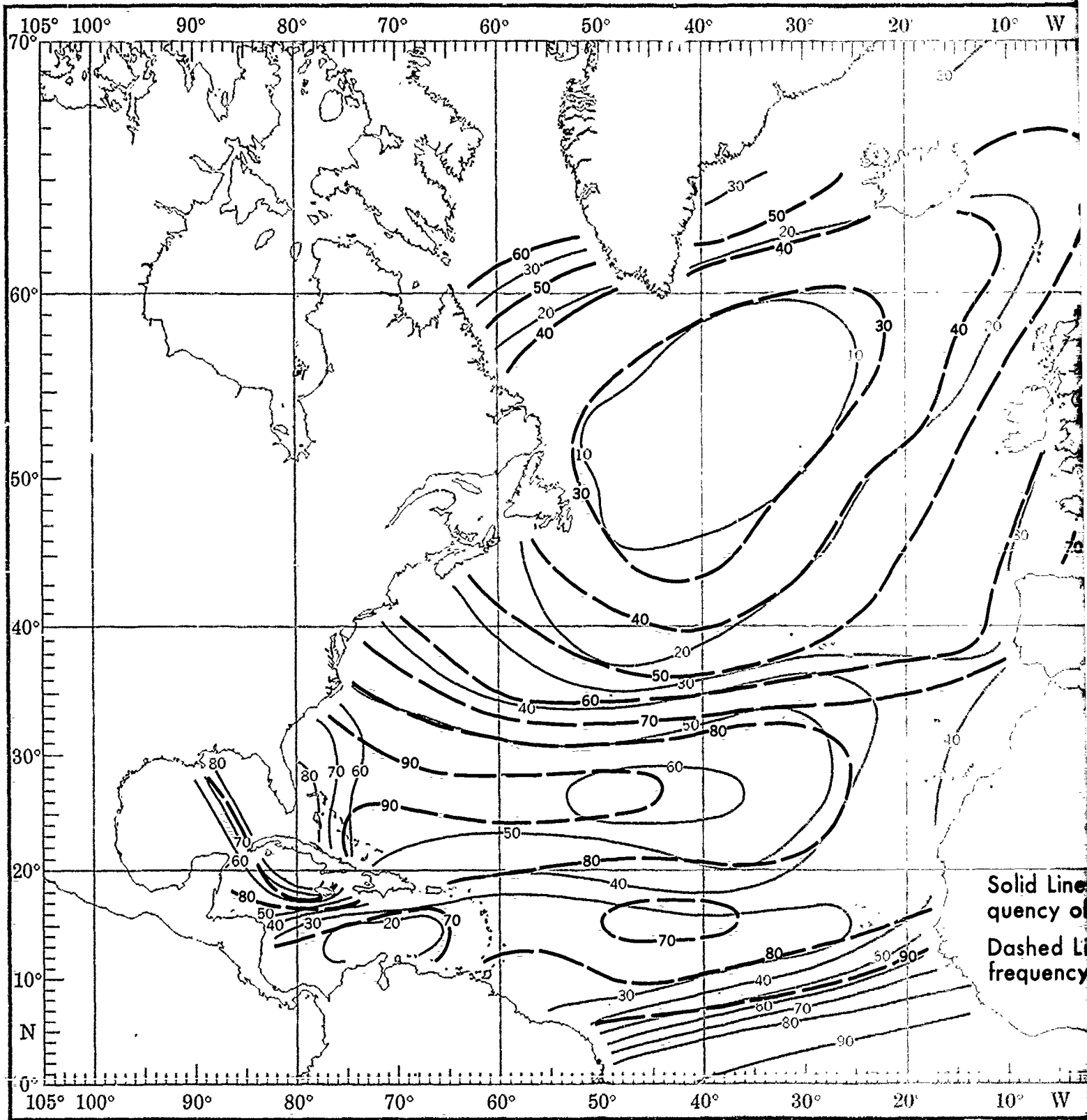


Solid Line  
quency of  
Dashed Line  
frequency

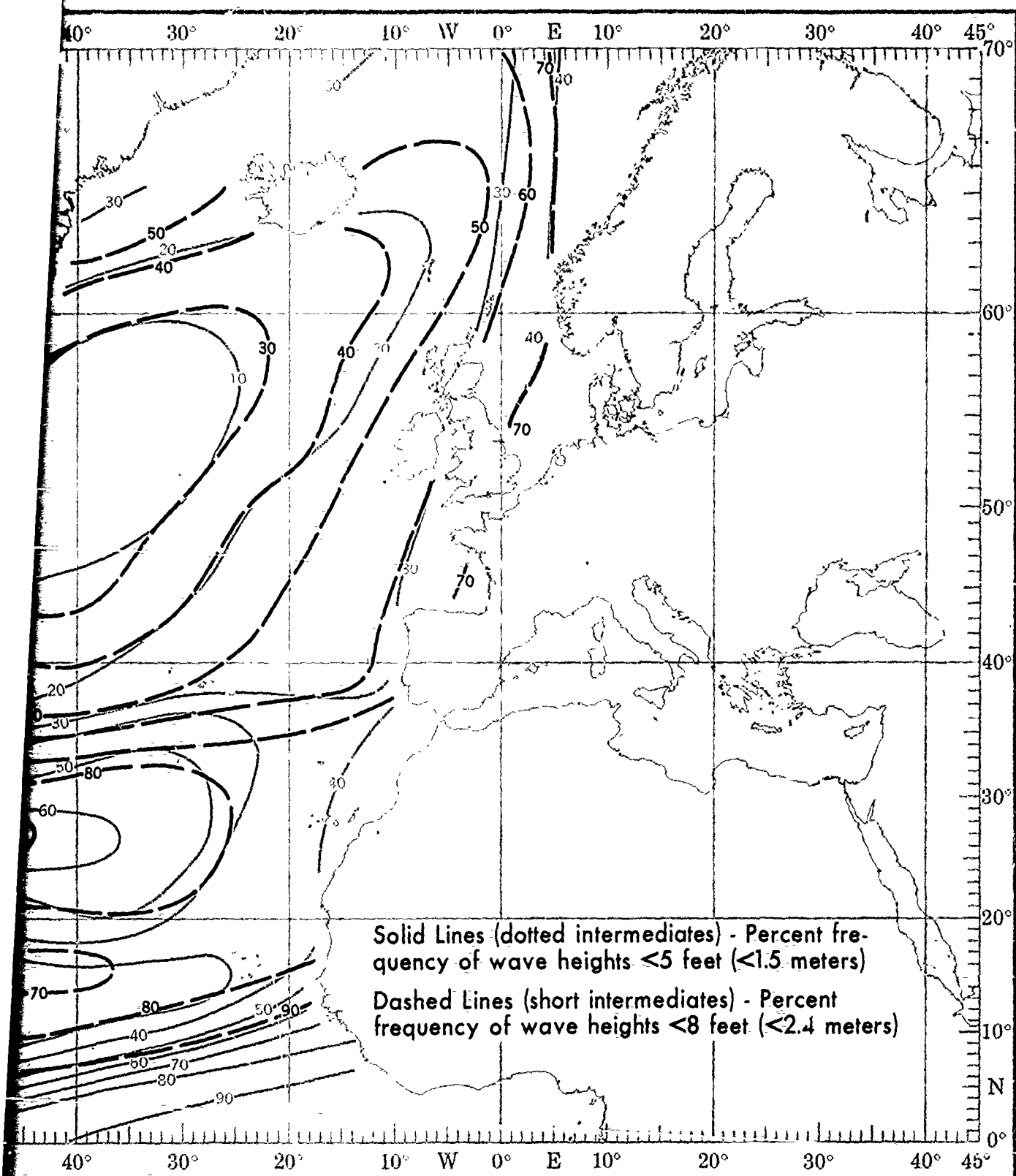
# WAVE HEIGHT (<5 AND <8 FEET)



# WAVE HEIGHT (<5 AND <8 FEET)

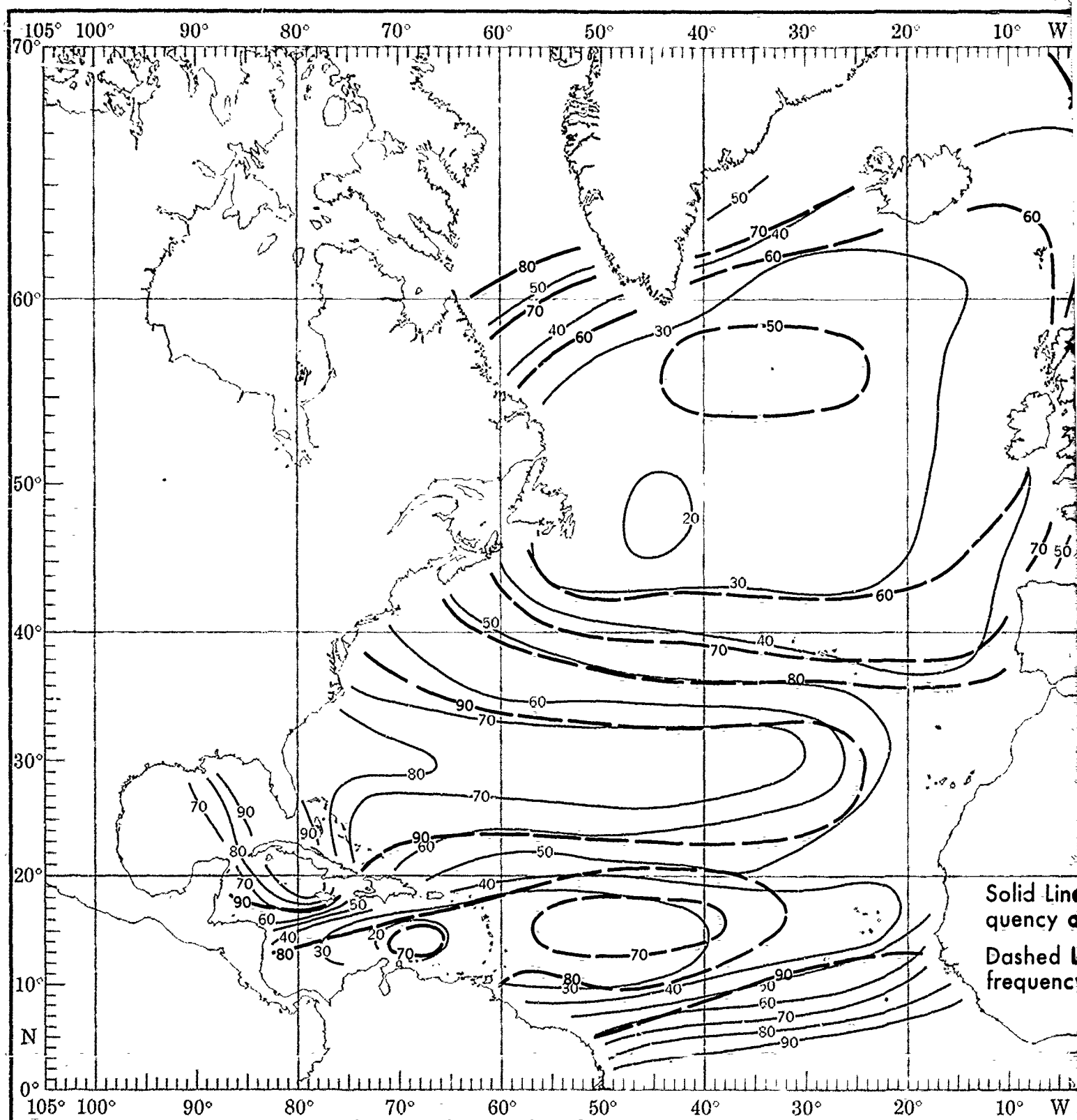


# APRIL



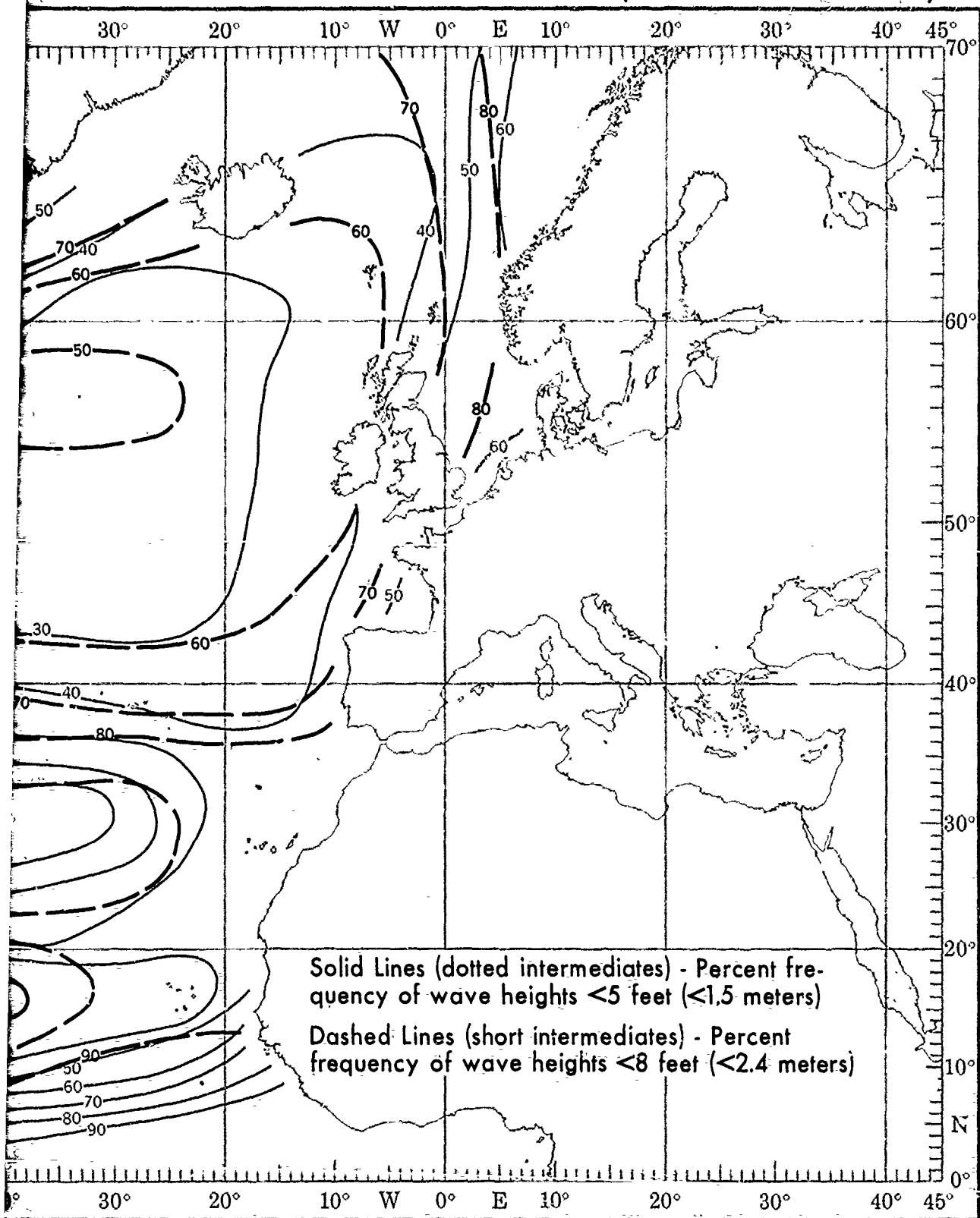
MAY

WA

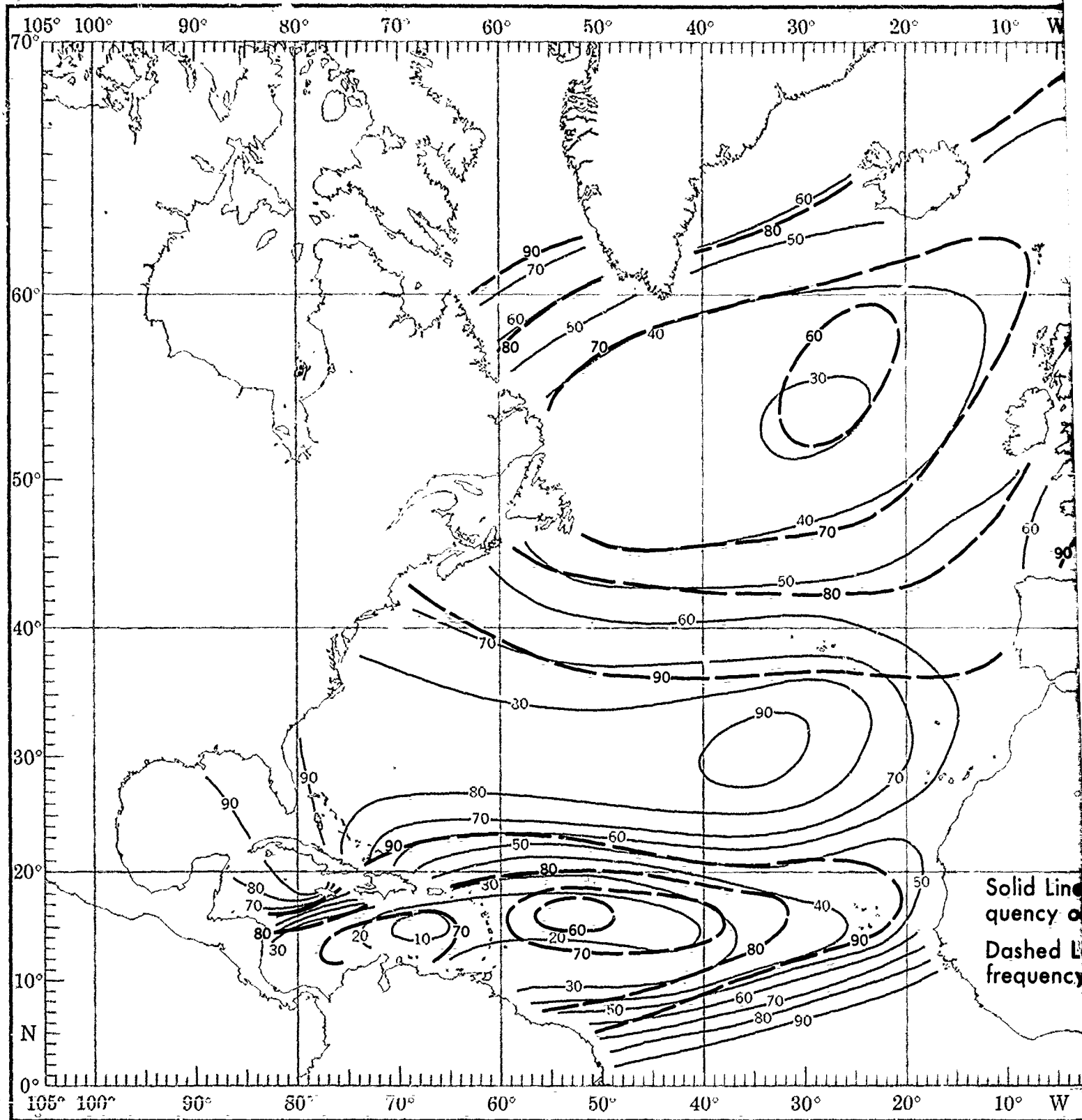




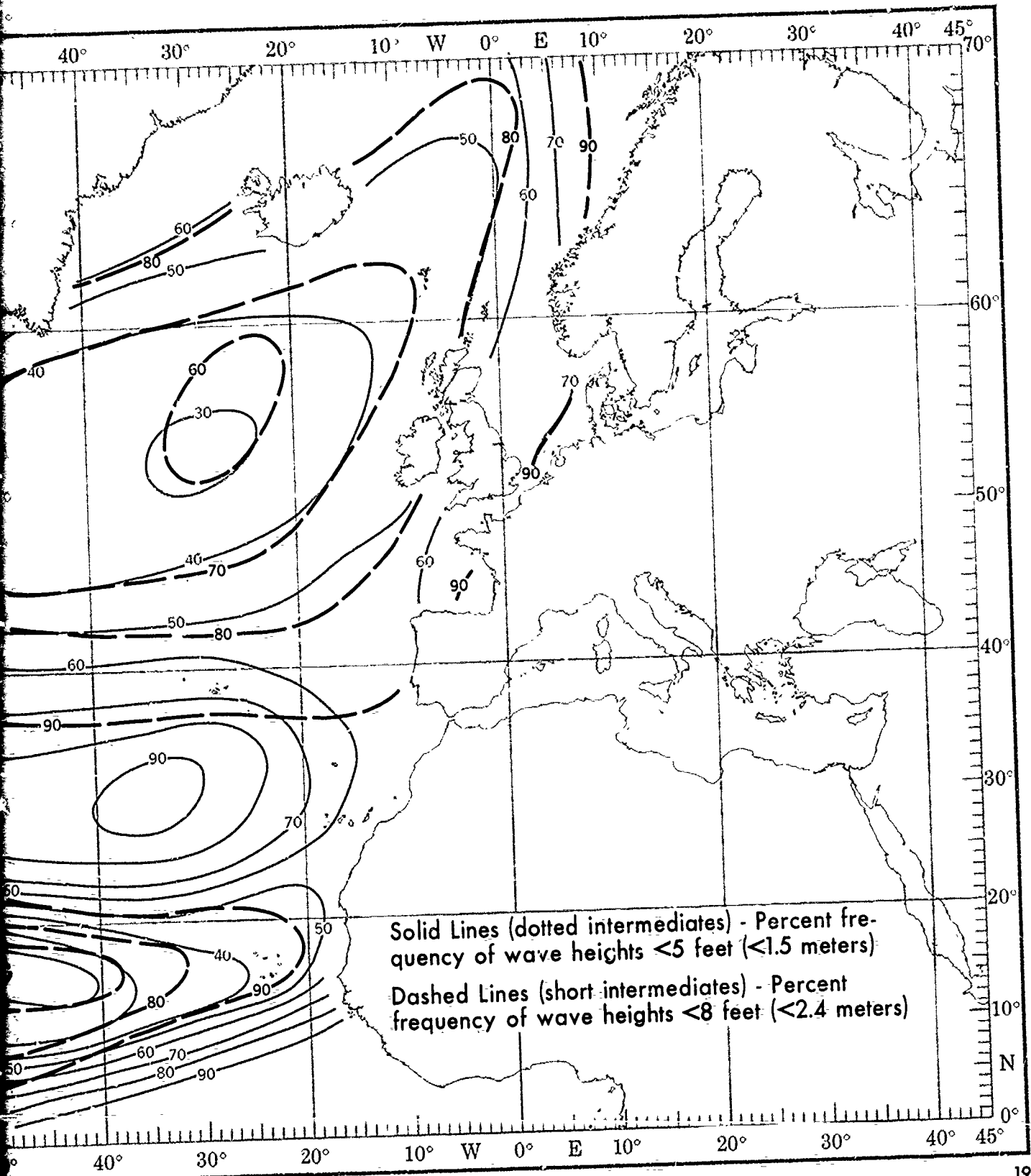
# WAVE HEIGHT (<5 AND <8 FEET)



# WAVE HEIGHT (<5 AND <8 FEET)

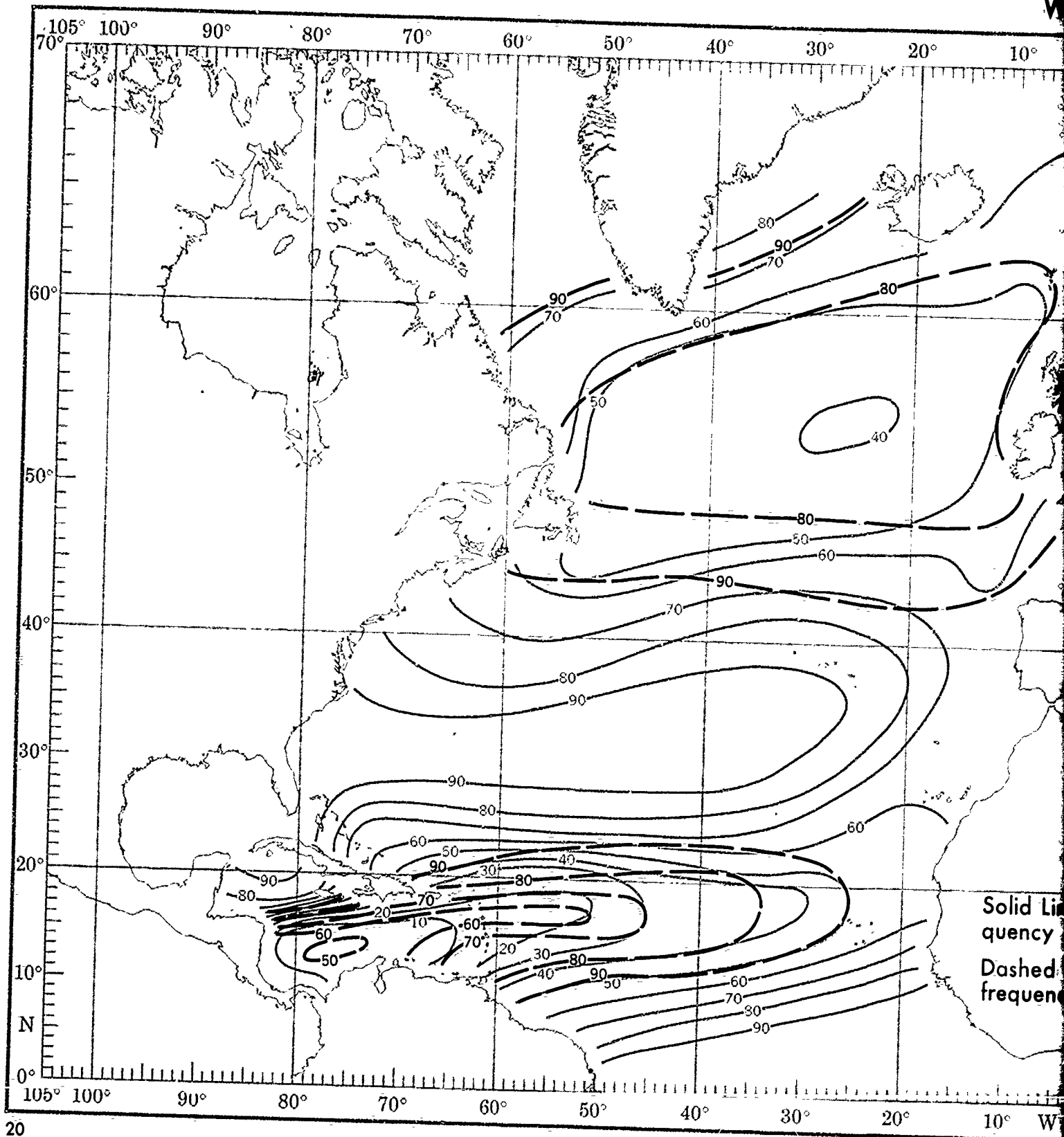


JUNE



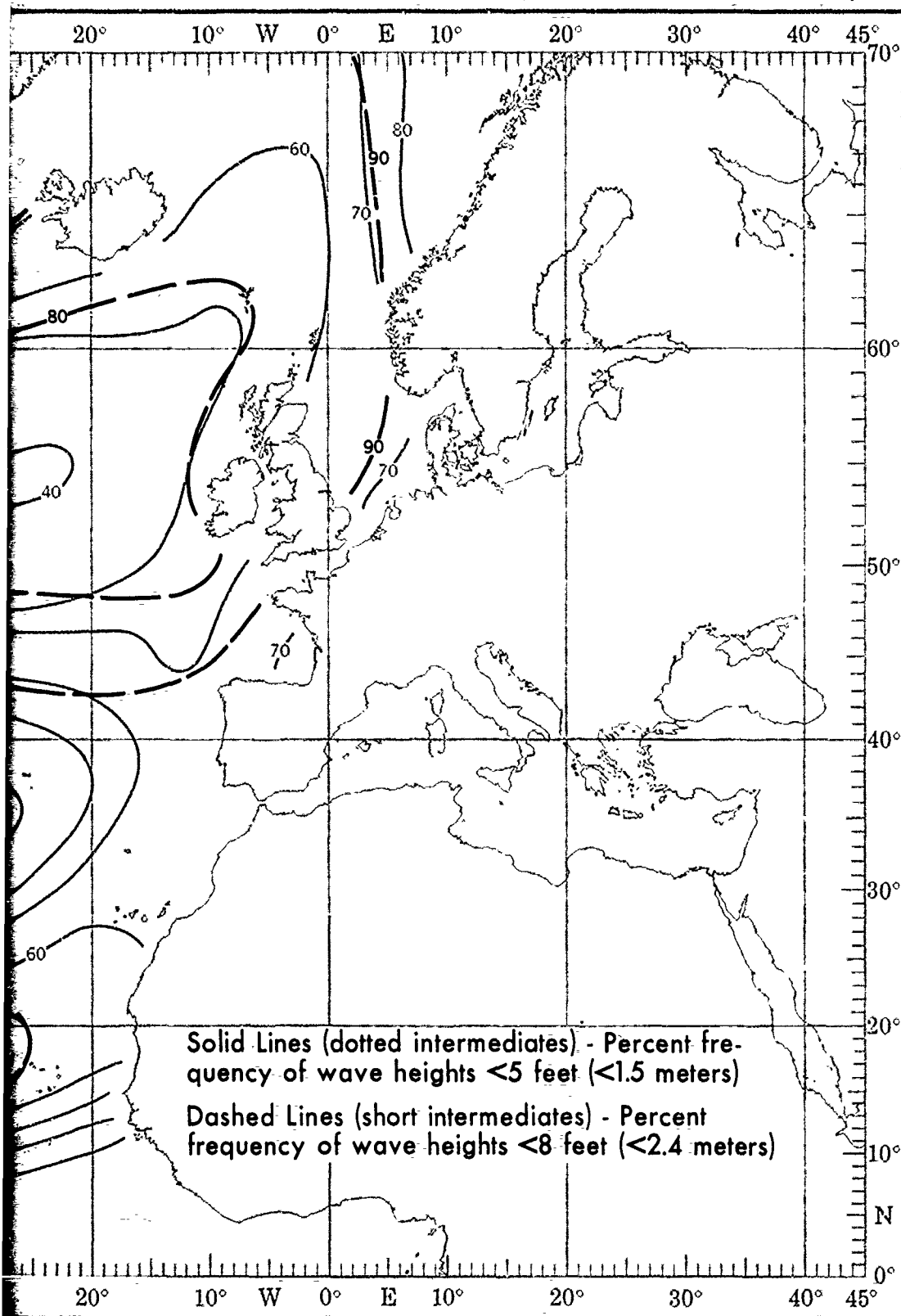
(2)

JULY

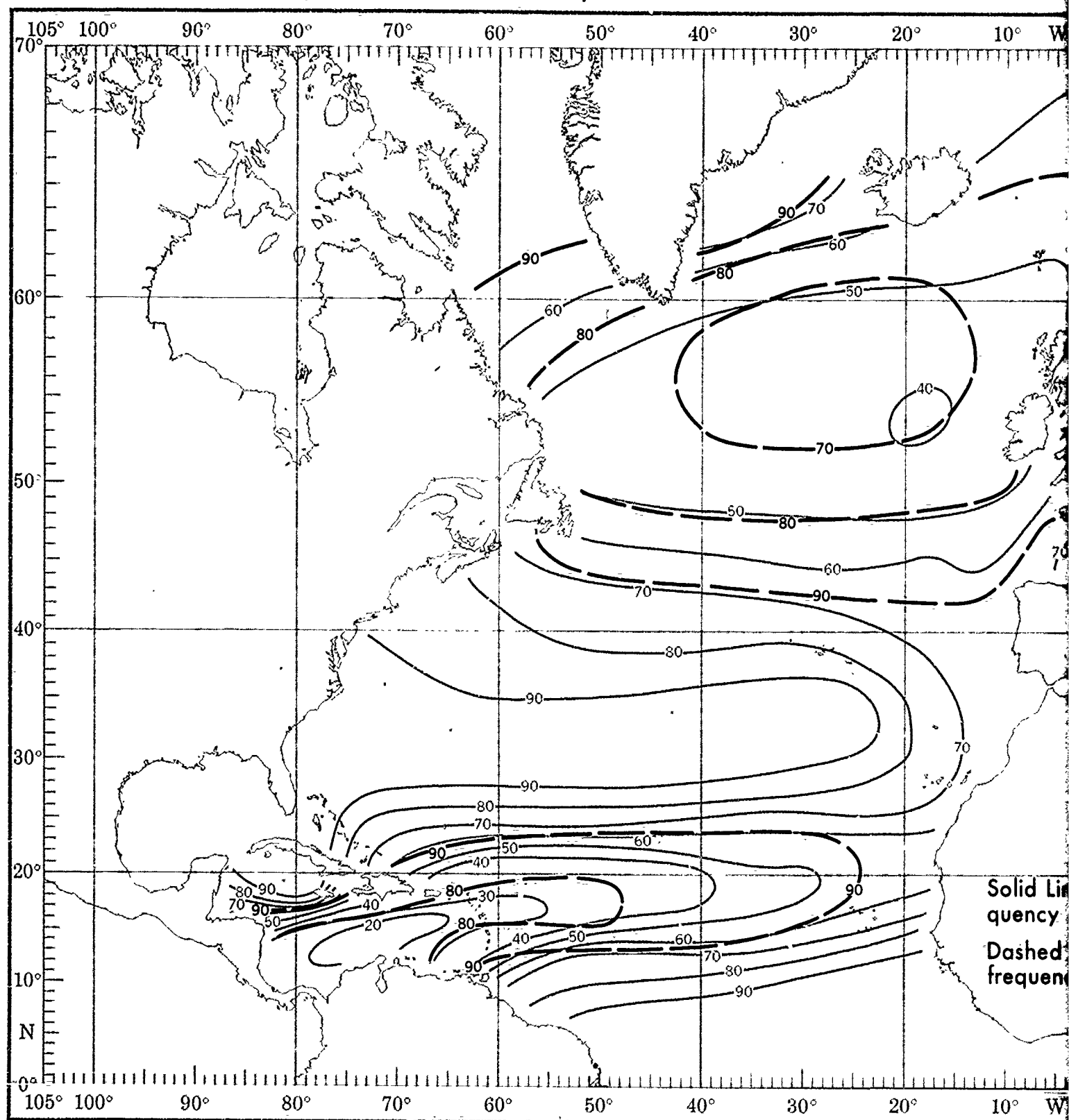


①

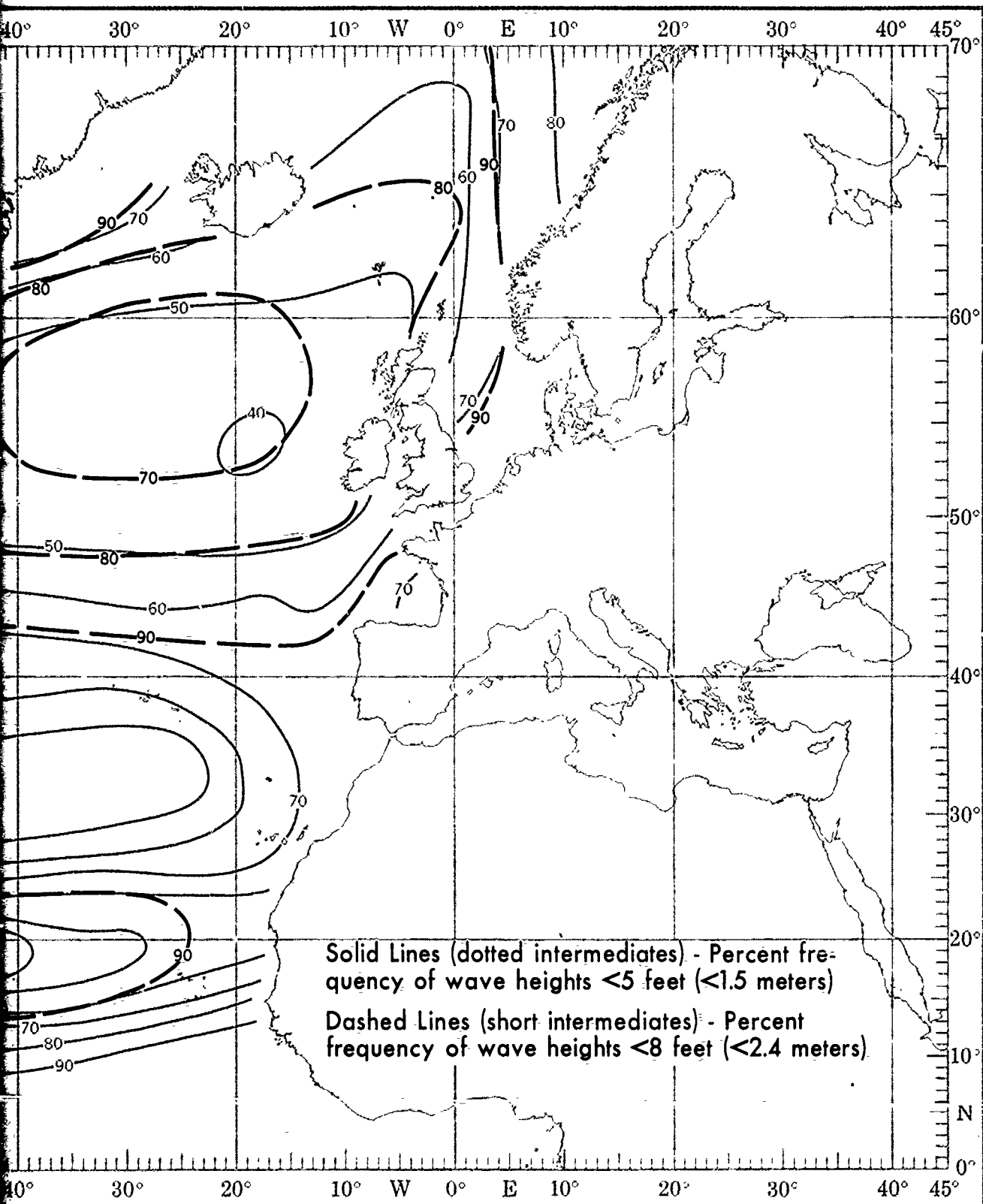
# WAVE HEIGHT (<5 AND <8 FEET)



# WAVE HEIGHT (<5 AND <8 FEET)

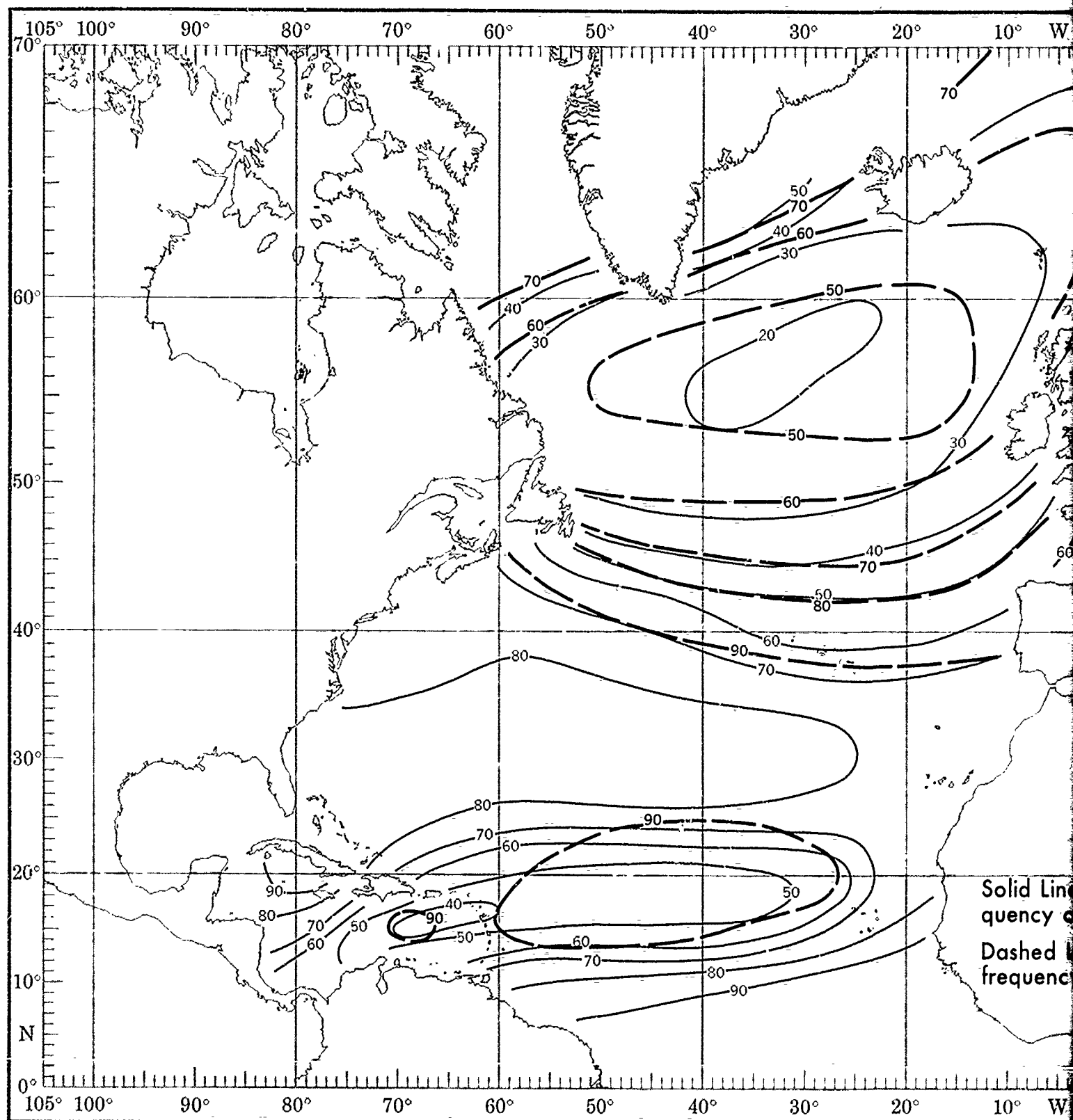


# AUGUST



# SEPTEMBER

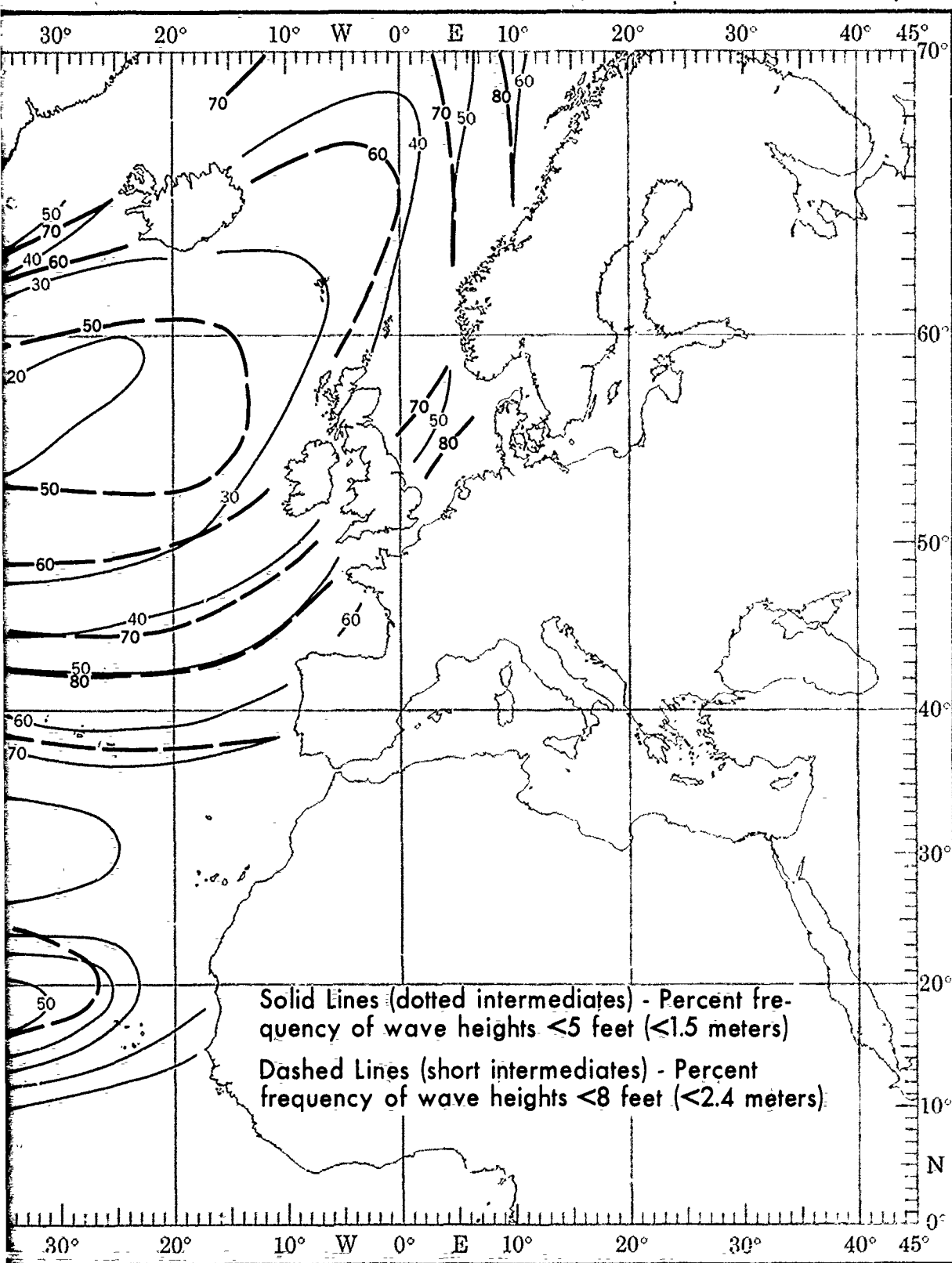
# WA



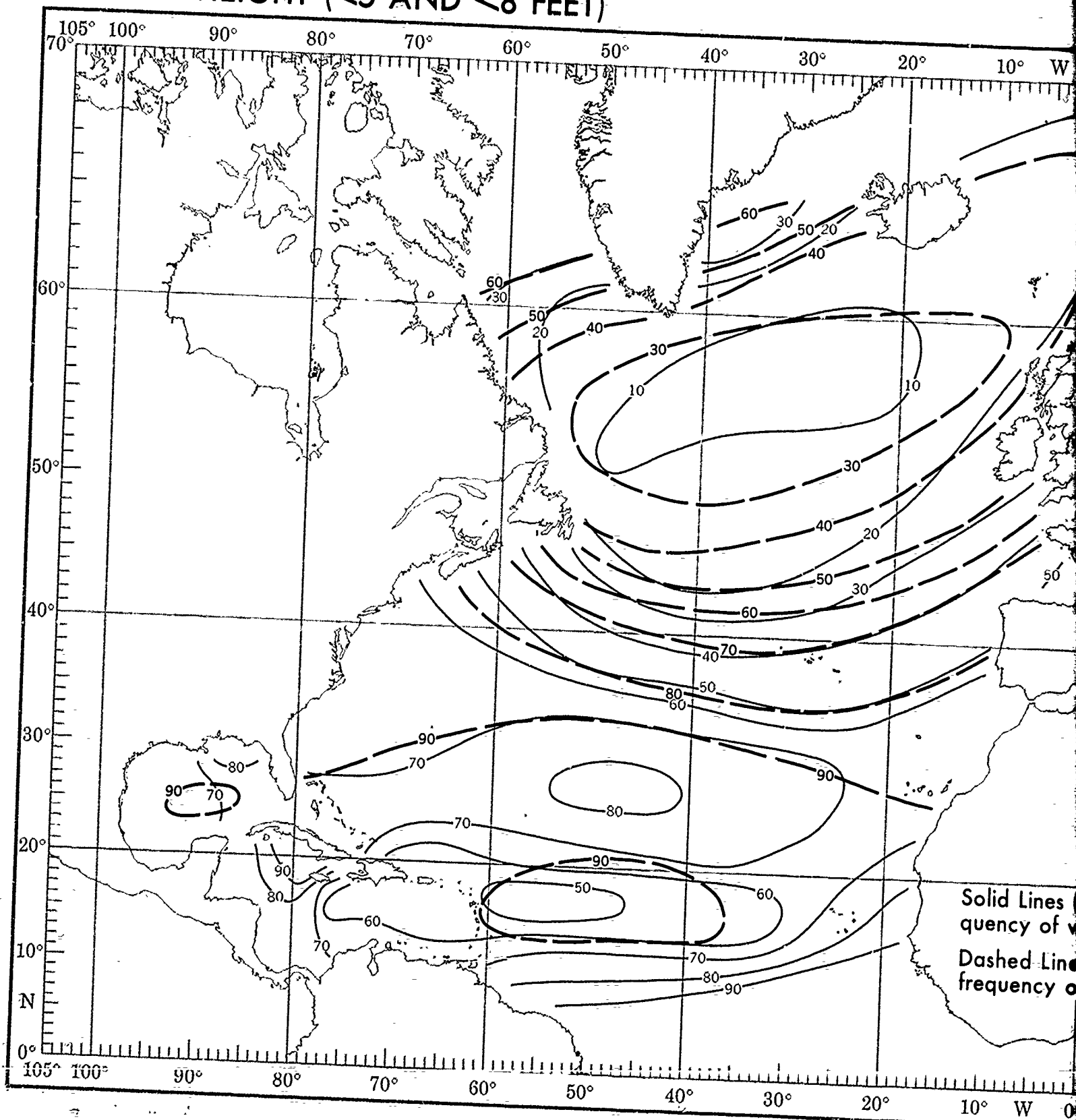
Solid Line  
frequency 1  
Dashed Line  
frequency 2



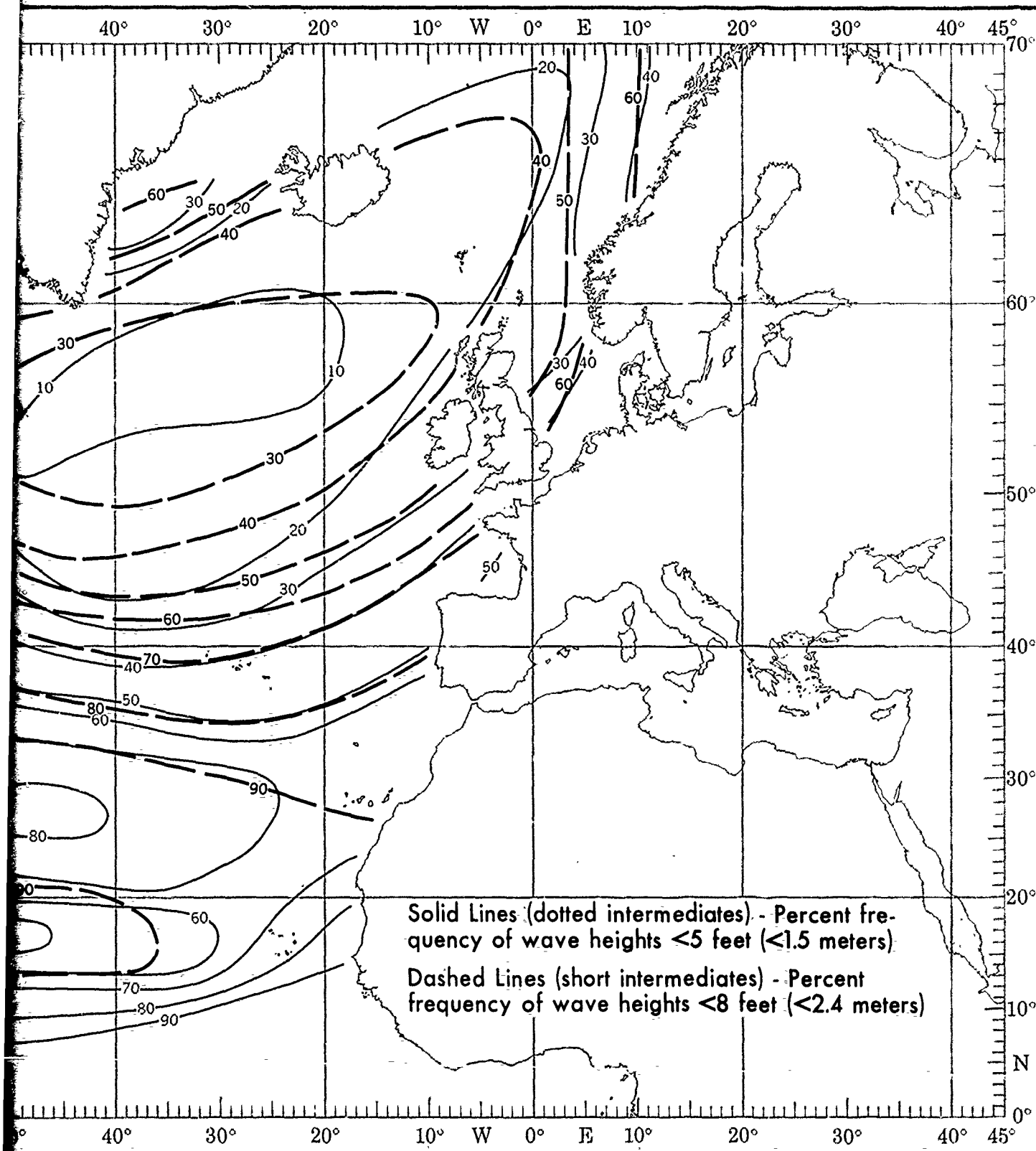
# WAVE HEIGHT (<5 AND <8 FEET)



# WAVE HEIGHT (<5 AND <8 FEET)

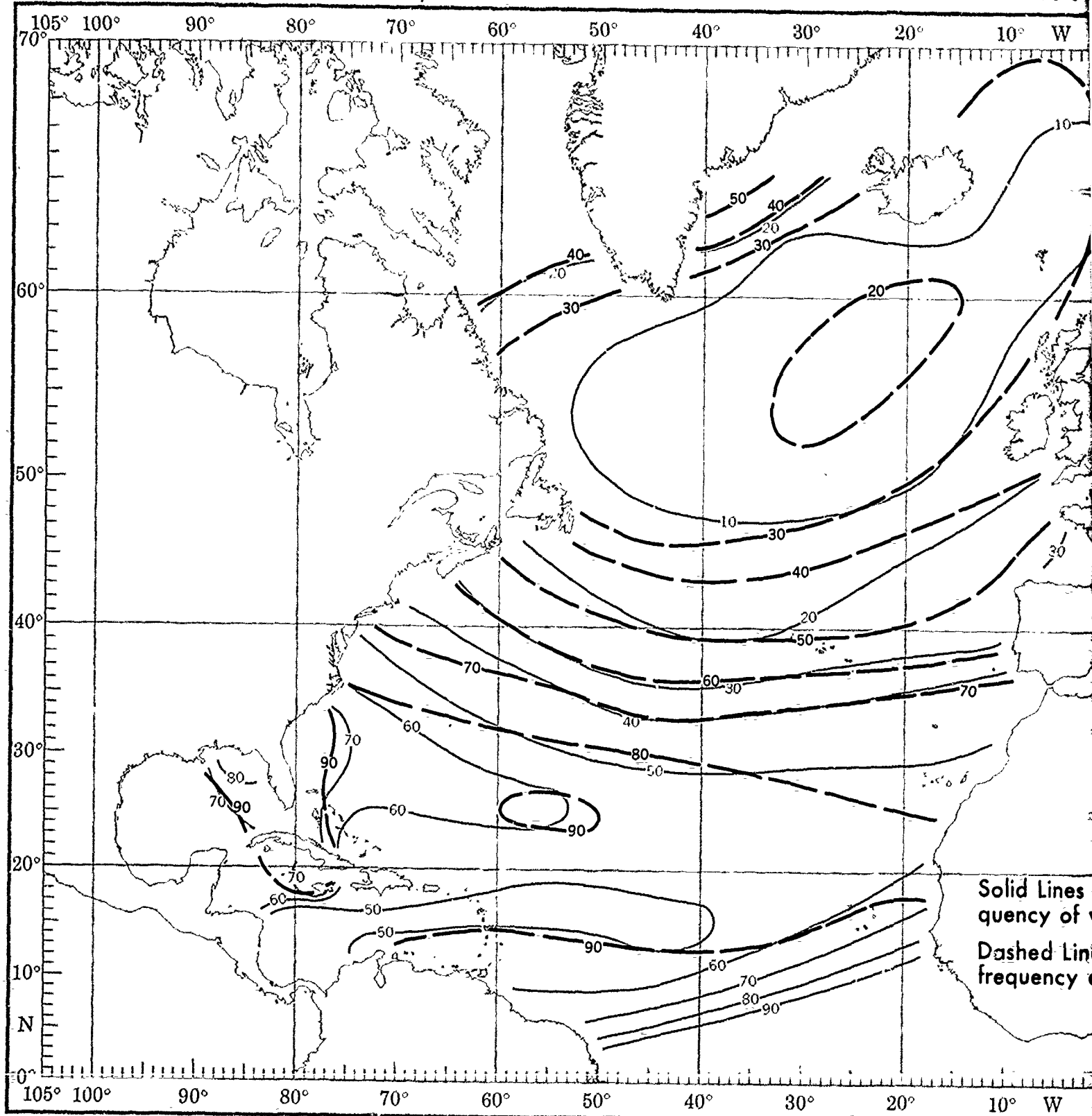


# OCTOBER

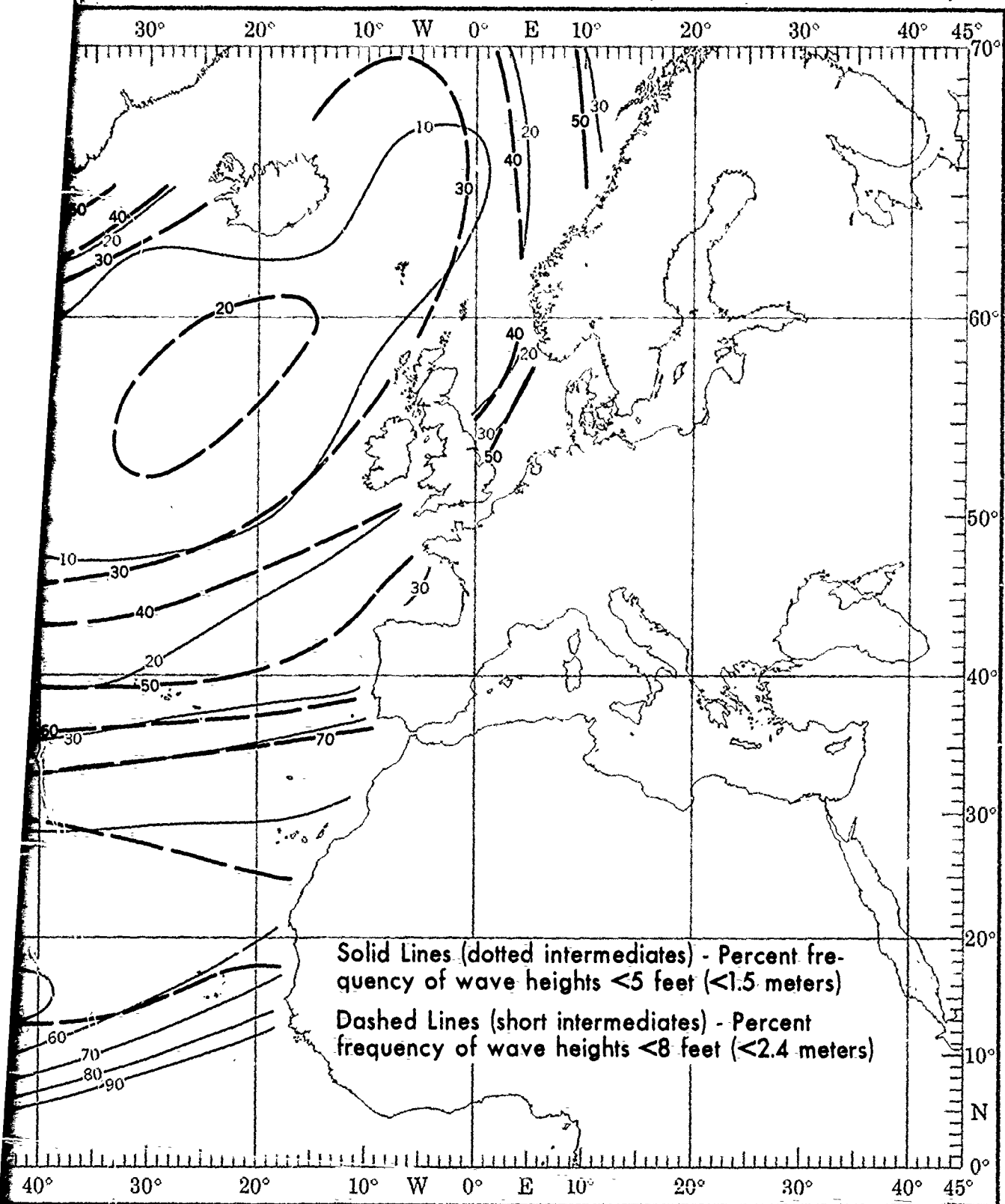


# NOVEMBER

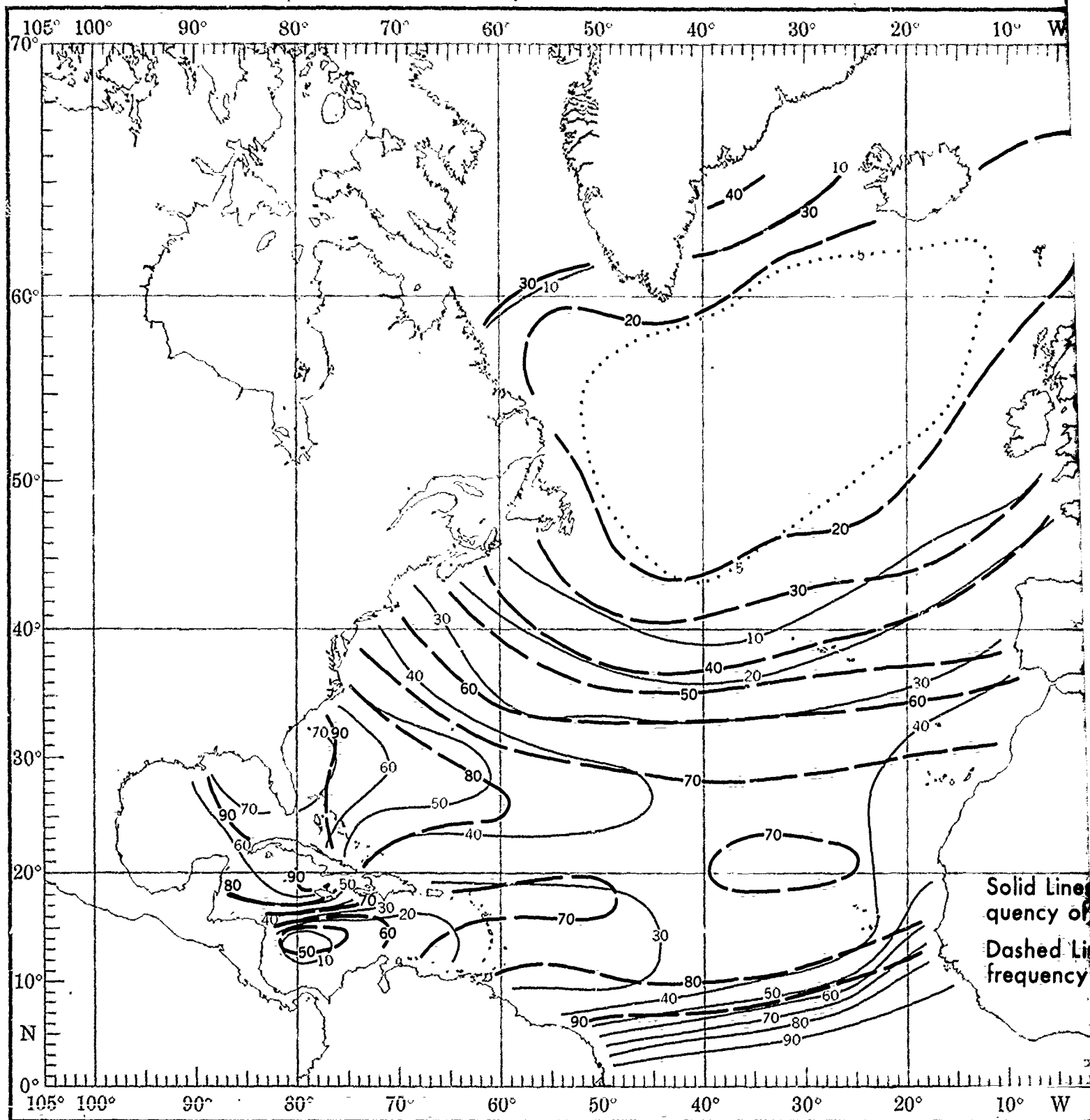
# W



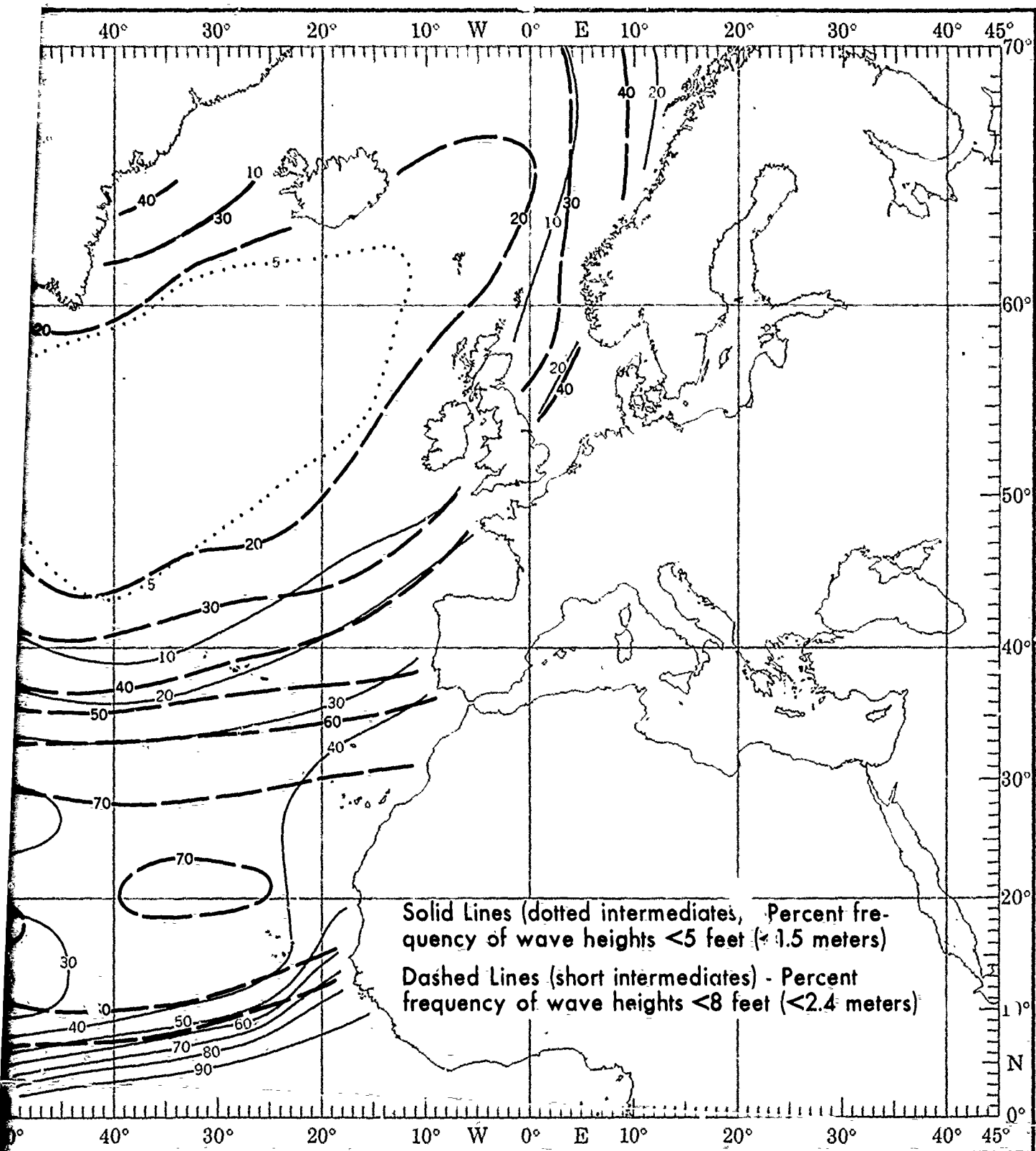
# WAVE HEIGHT (<5 AND <8 FEET)



# WAVE HEIGHT (<5 AND <8 FEET)

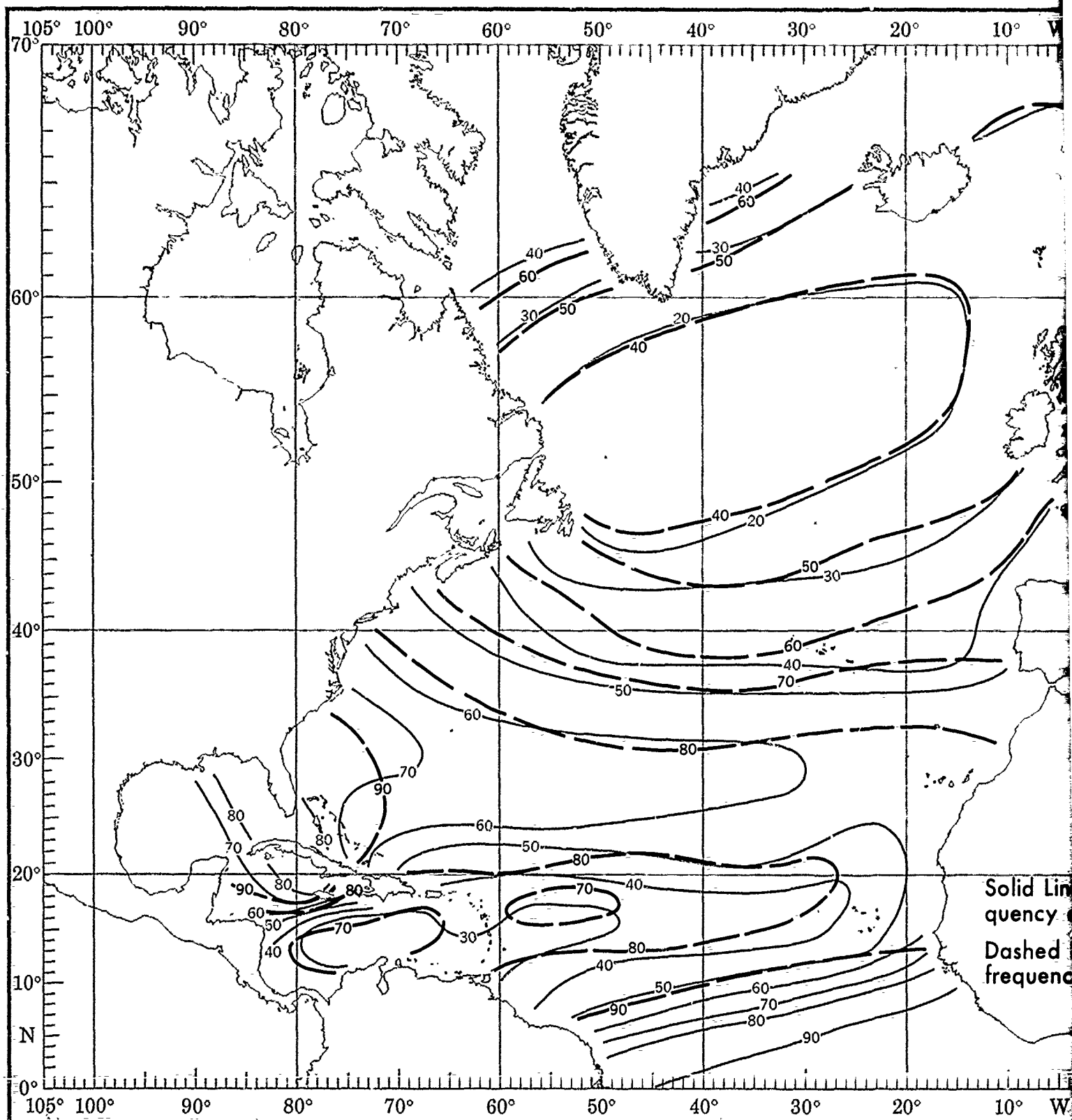


# DECEMBER



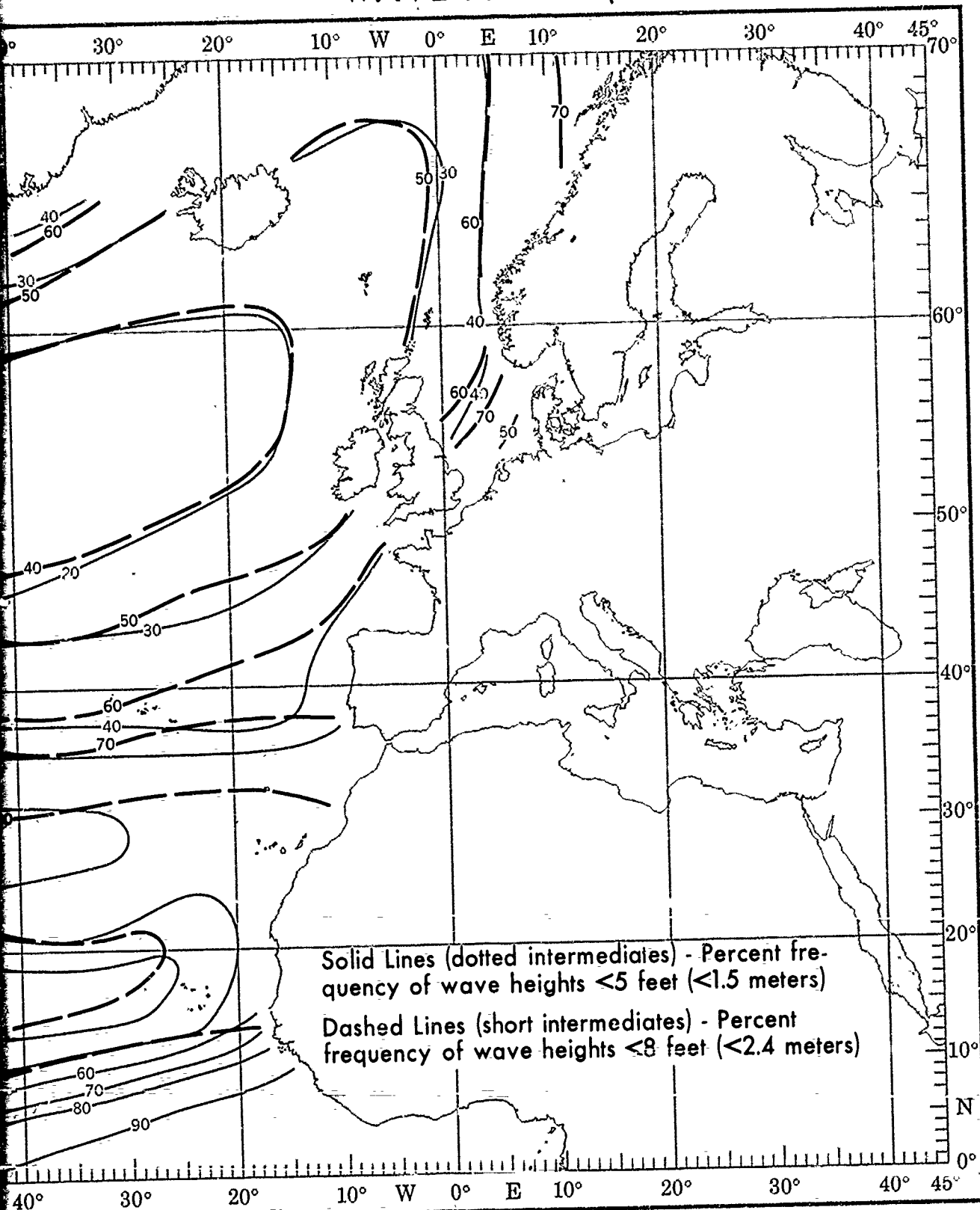
# ANNUAL

W

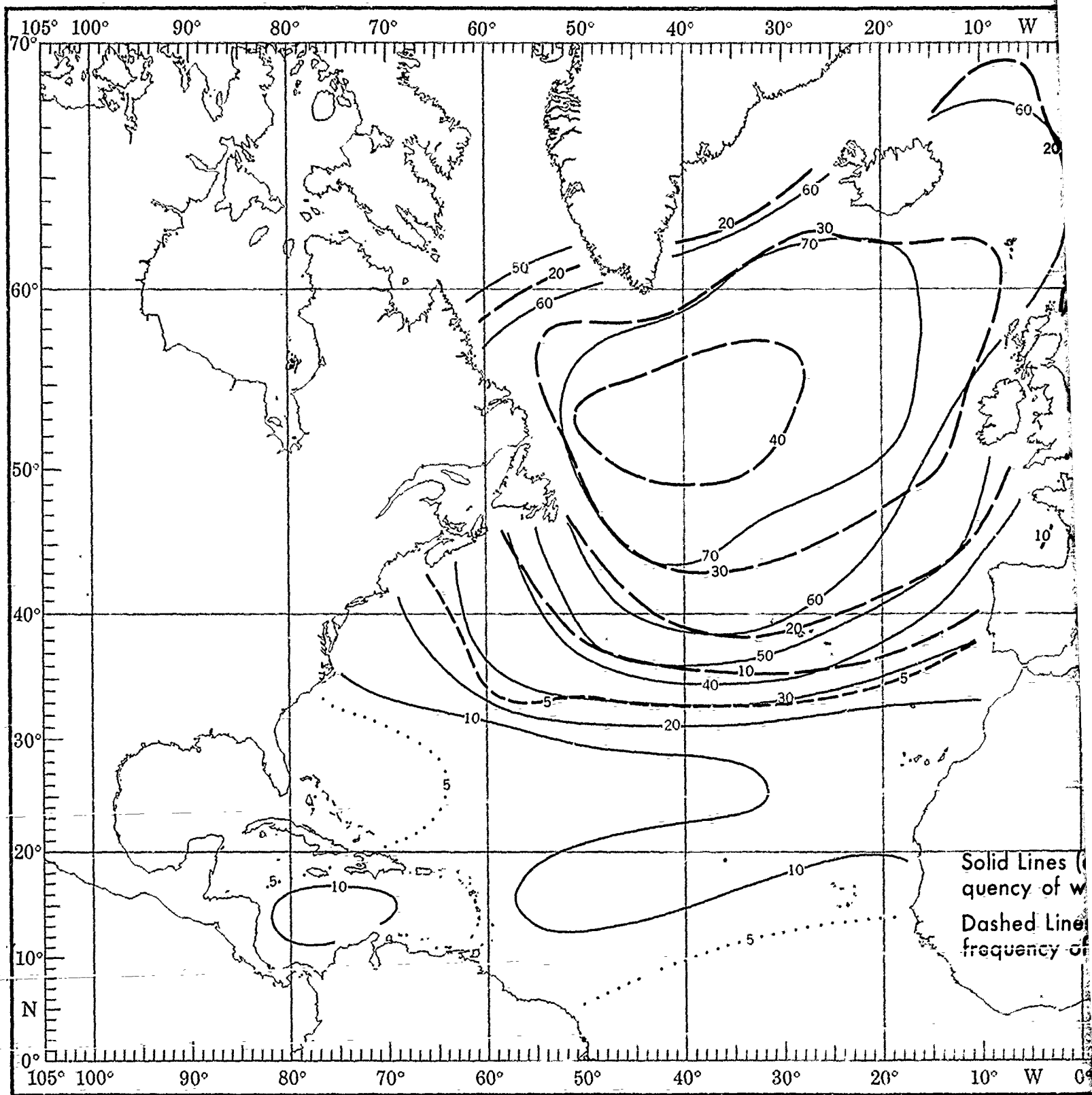




# WAVE HEIGHT (<5 AND <8 FEET)

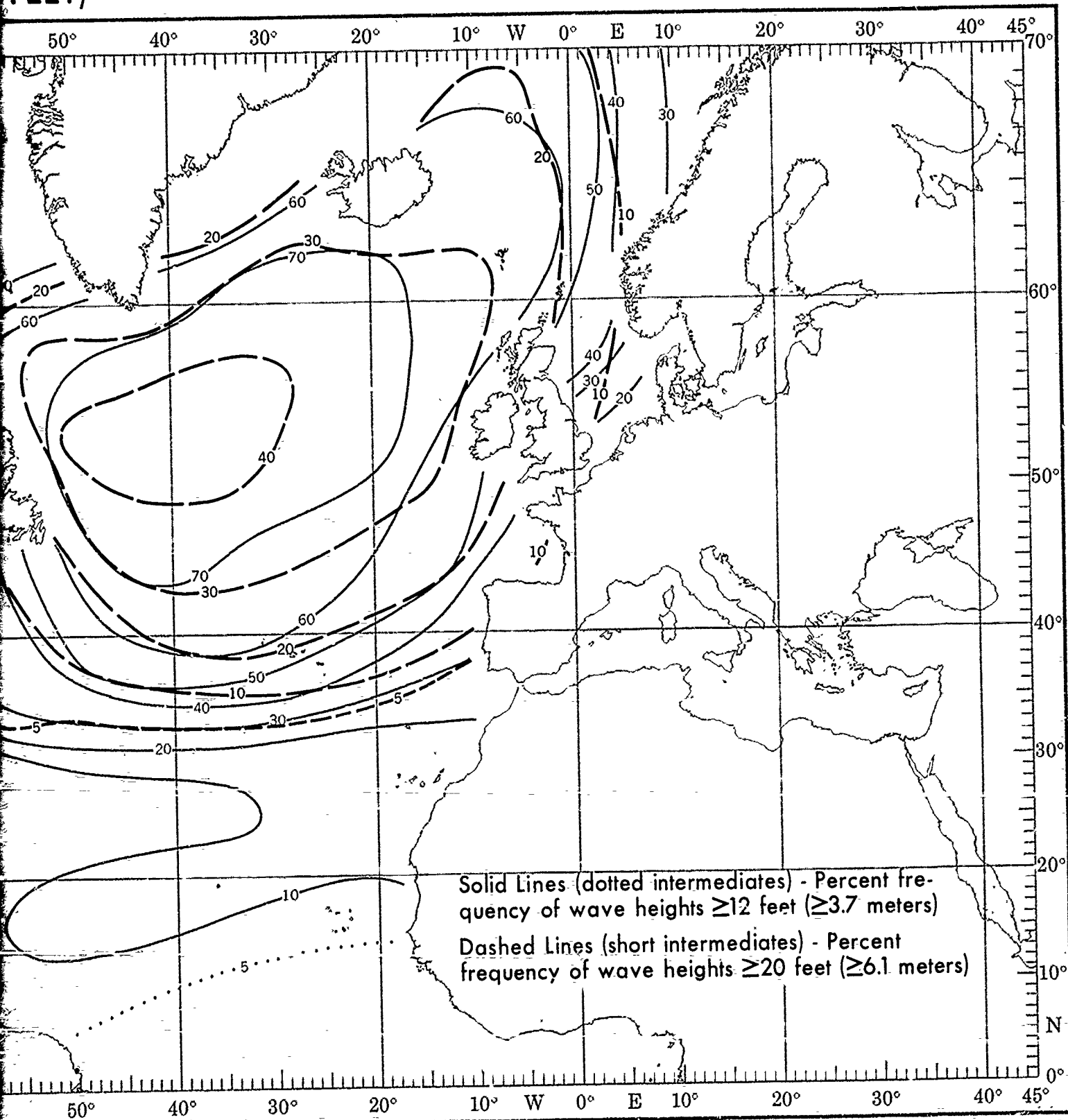


# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)



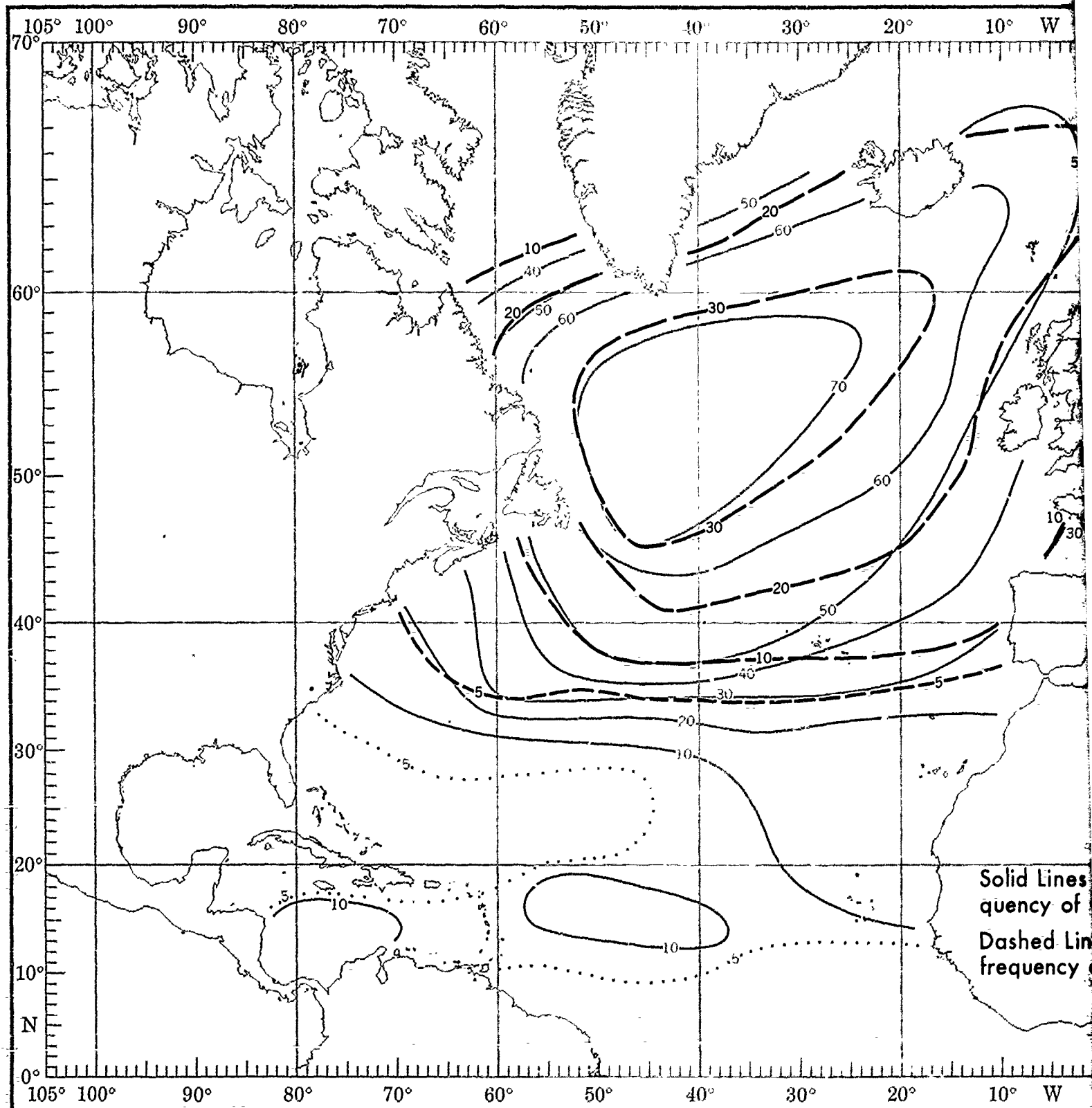
FEET)

JANUARY

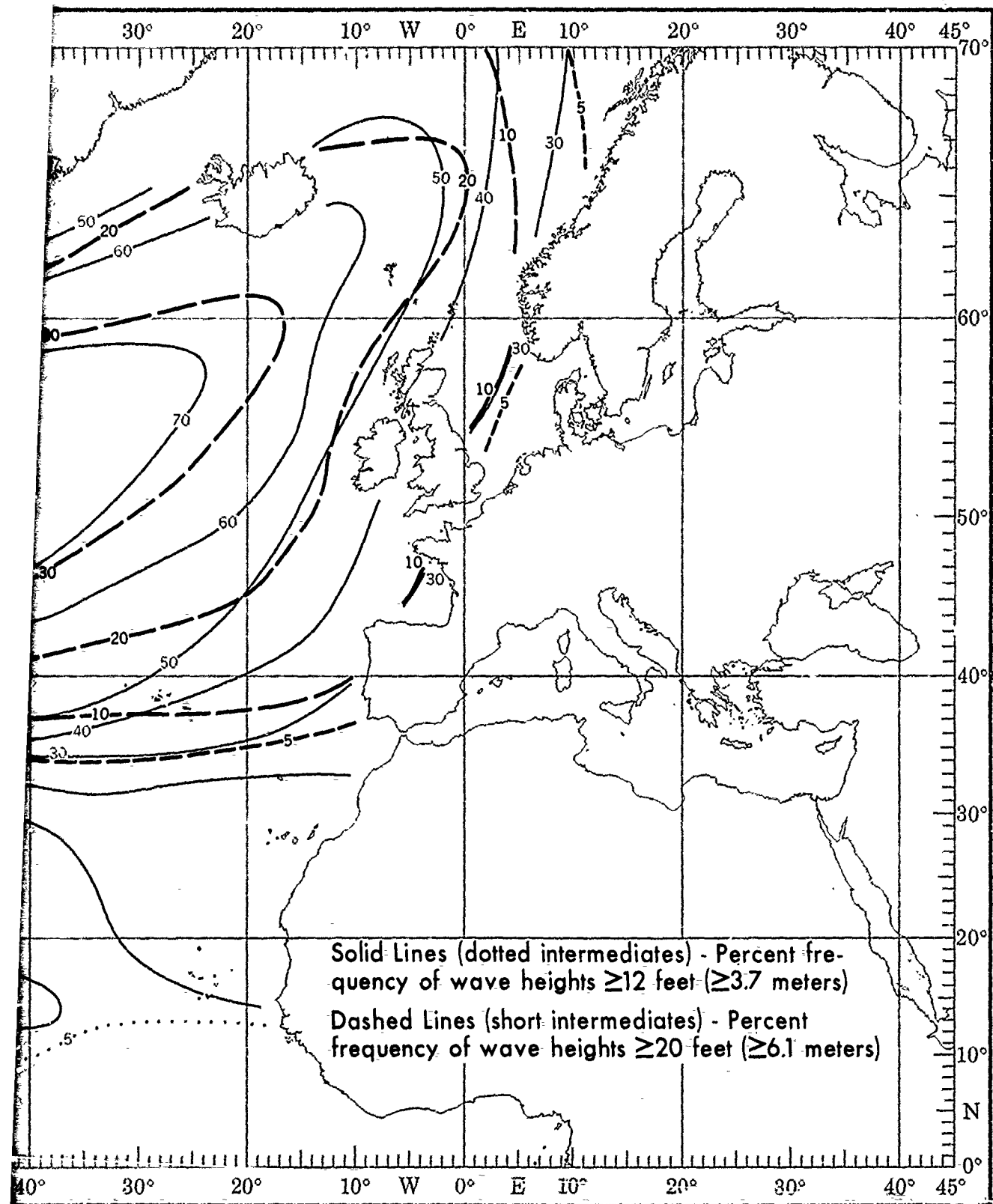


# FEBRUARY

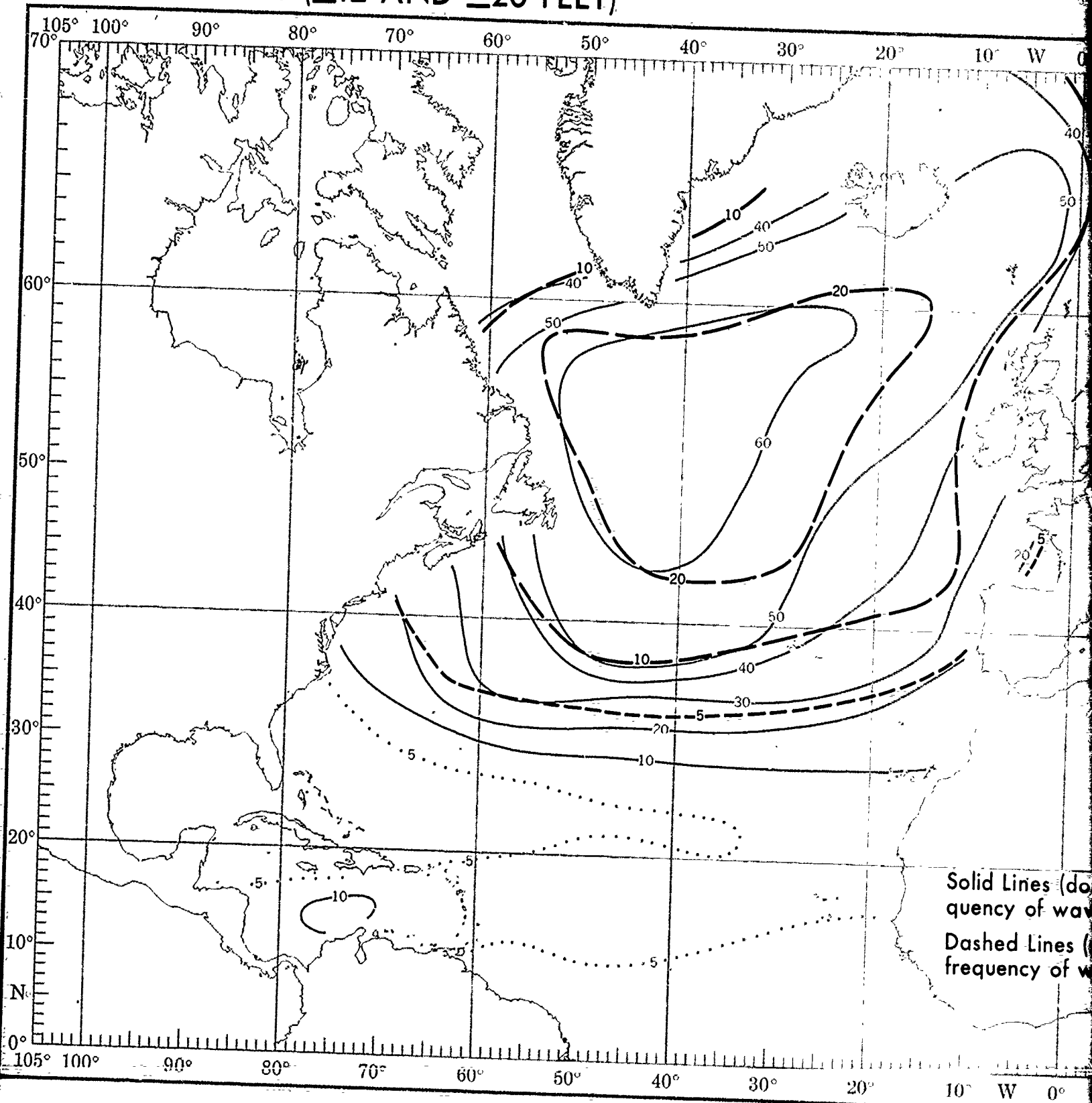
# WAVE



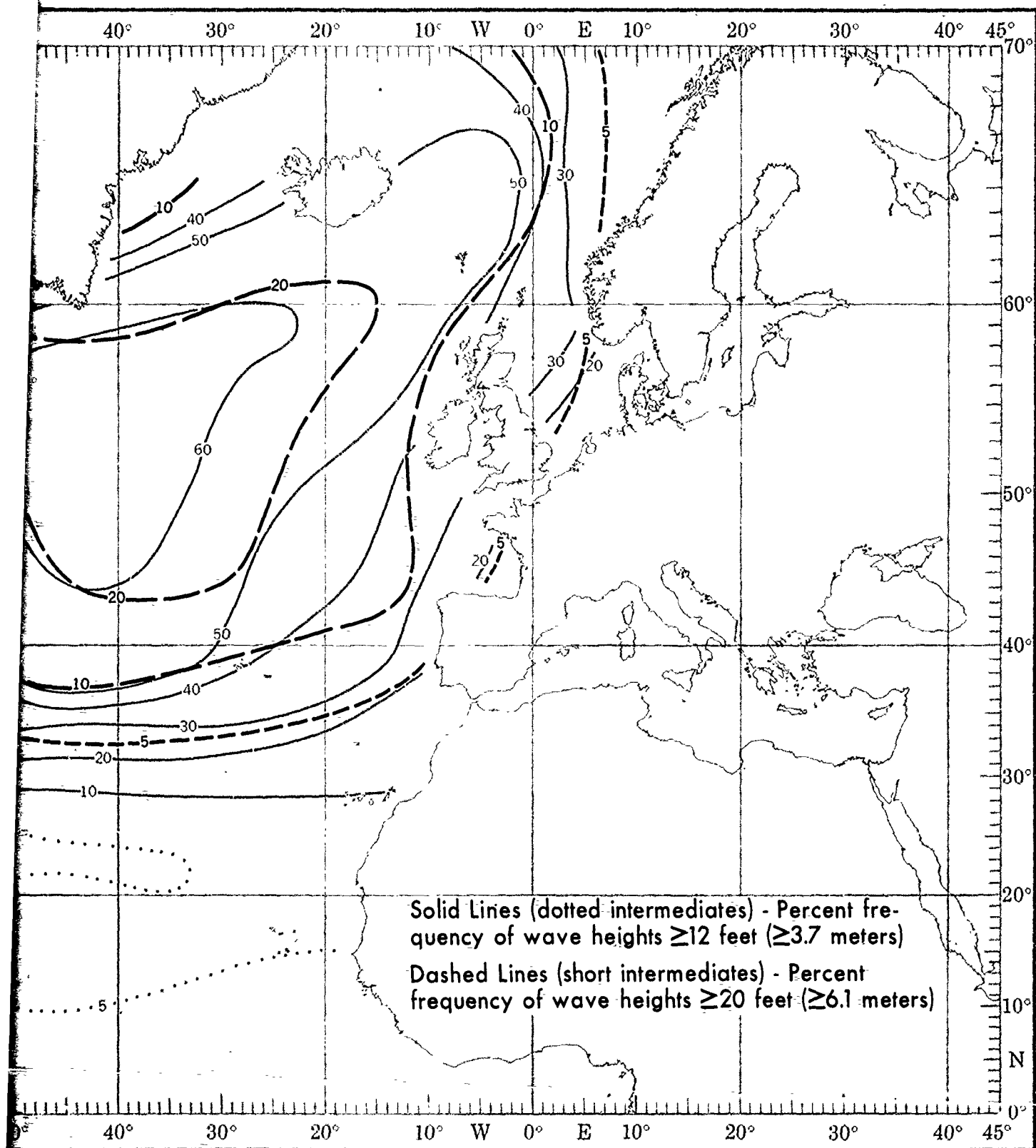
# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)



# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)

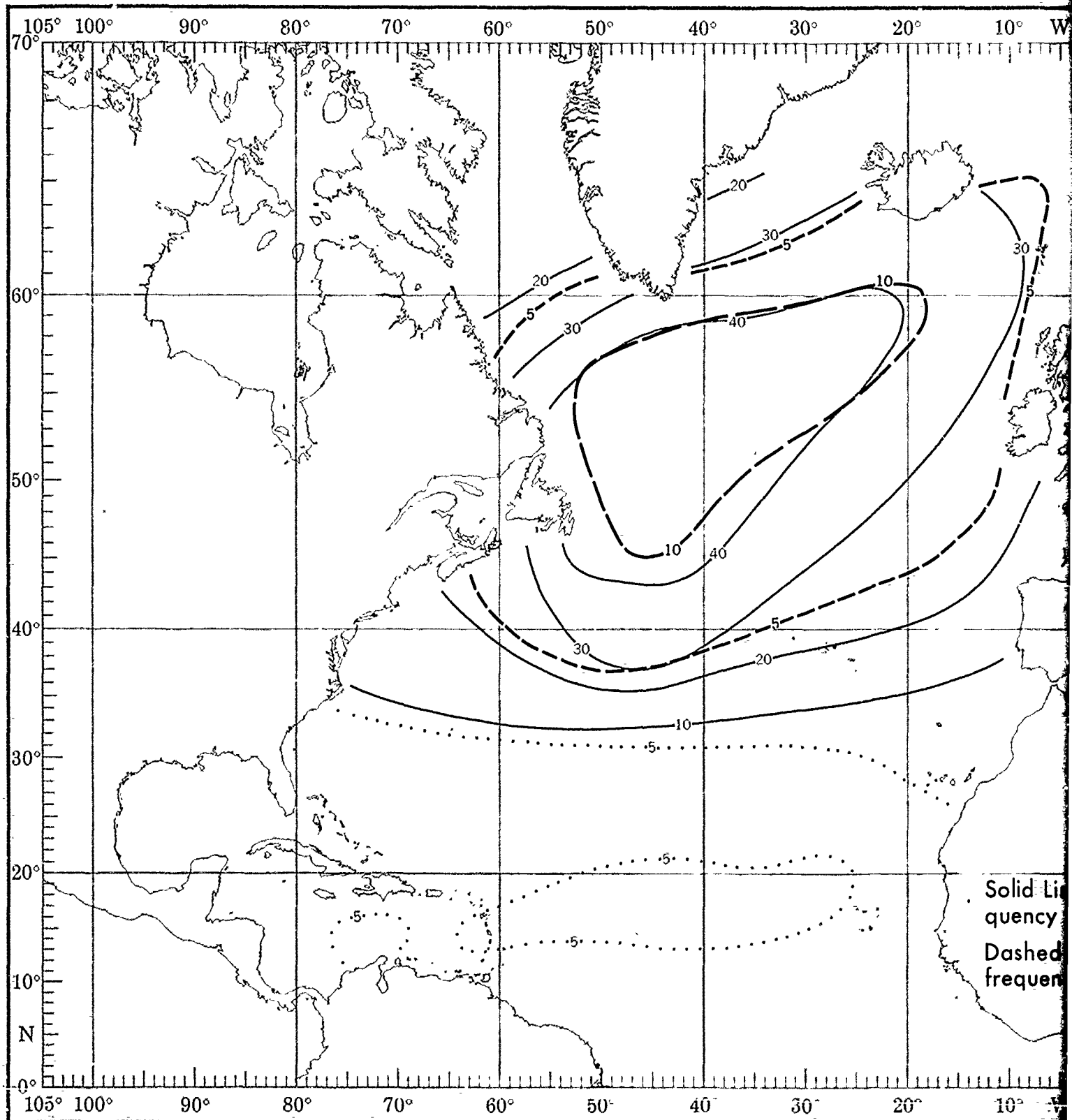


# MARCH



APRIL

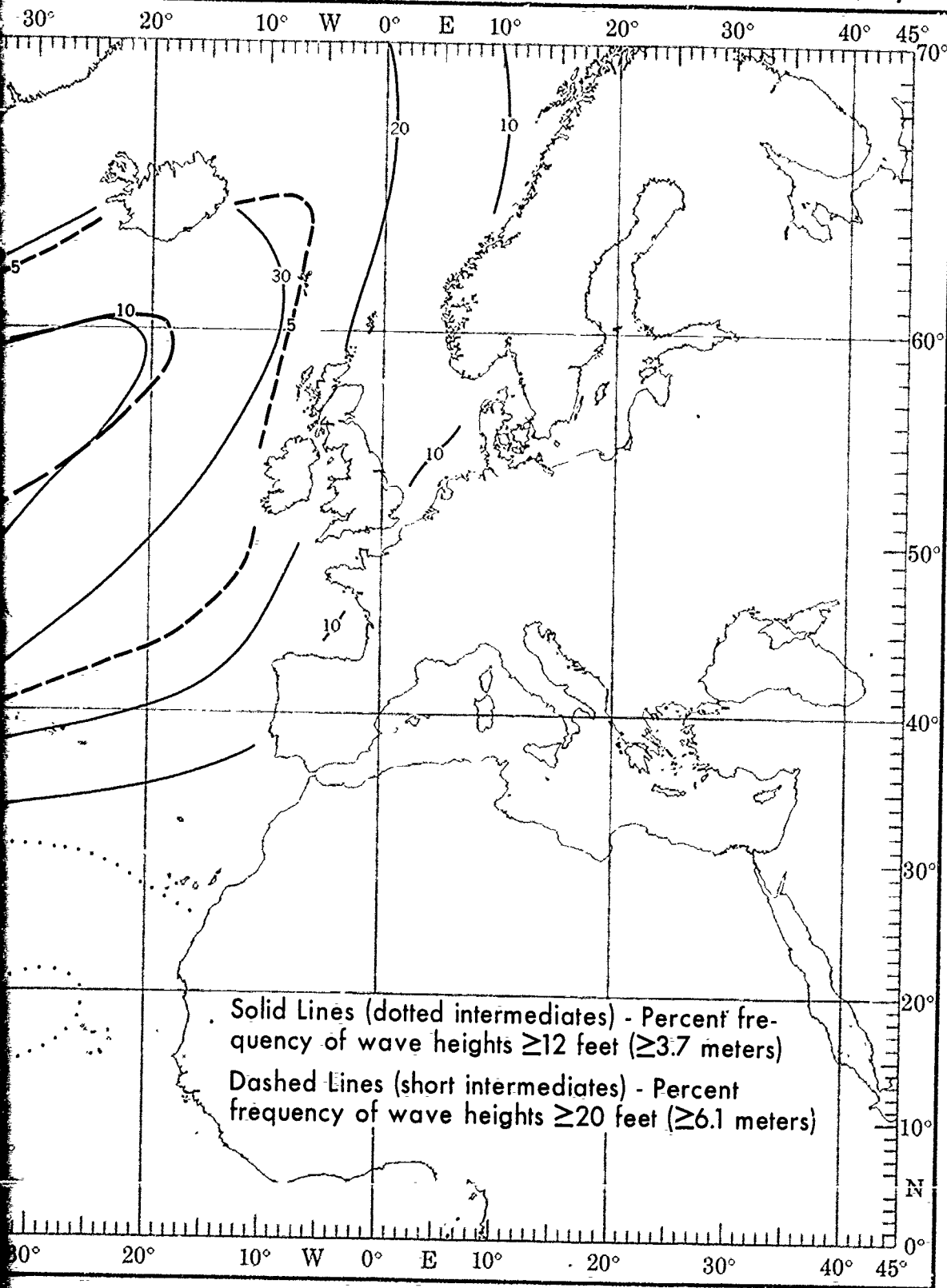
WAV



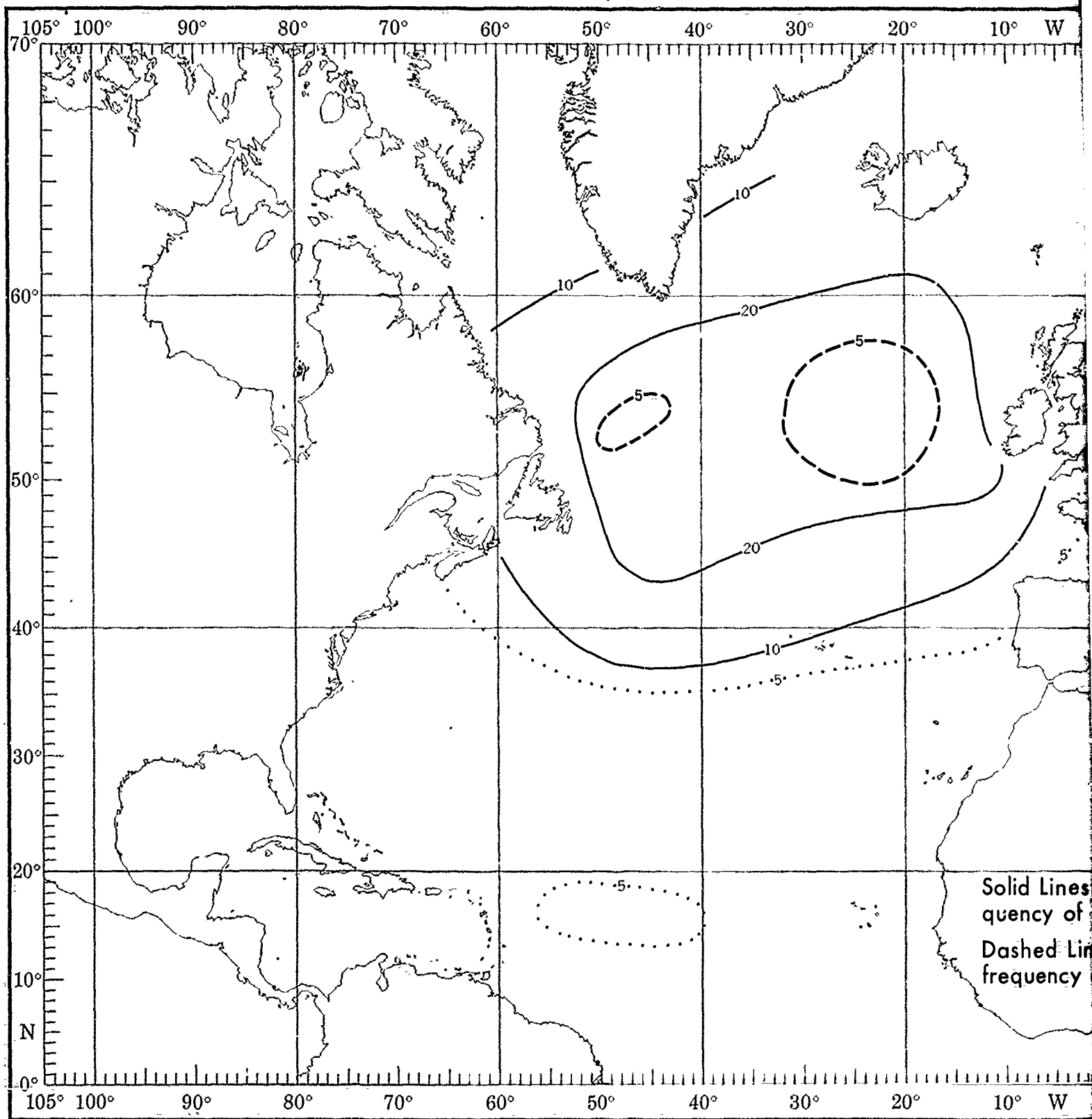
Solid Line  
Low frequency  
Dashed Line  
Medium frequency  
Dotted Line  
High frequency



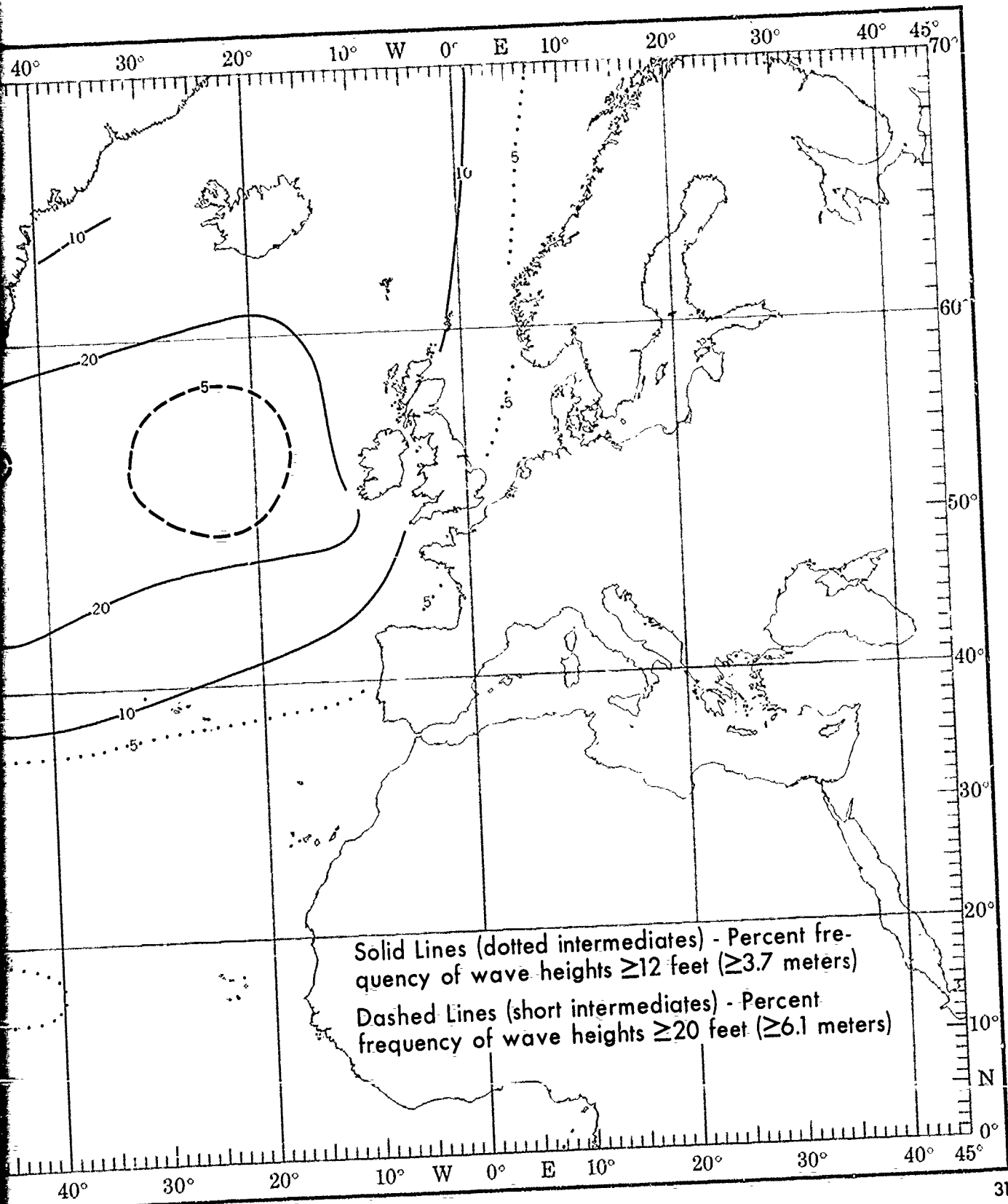
# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)



# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)



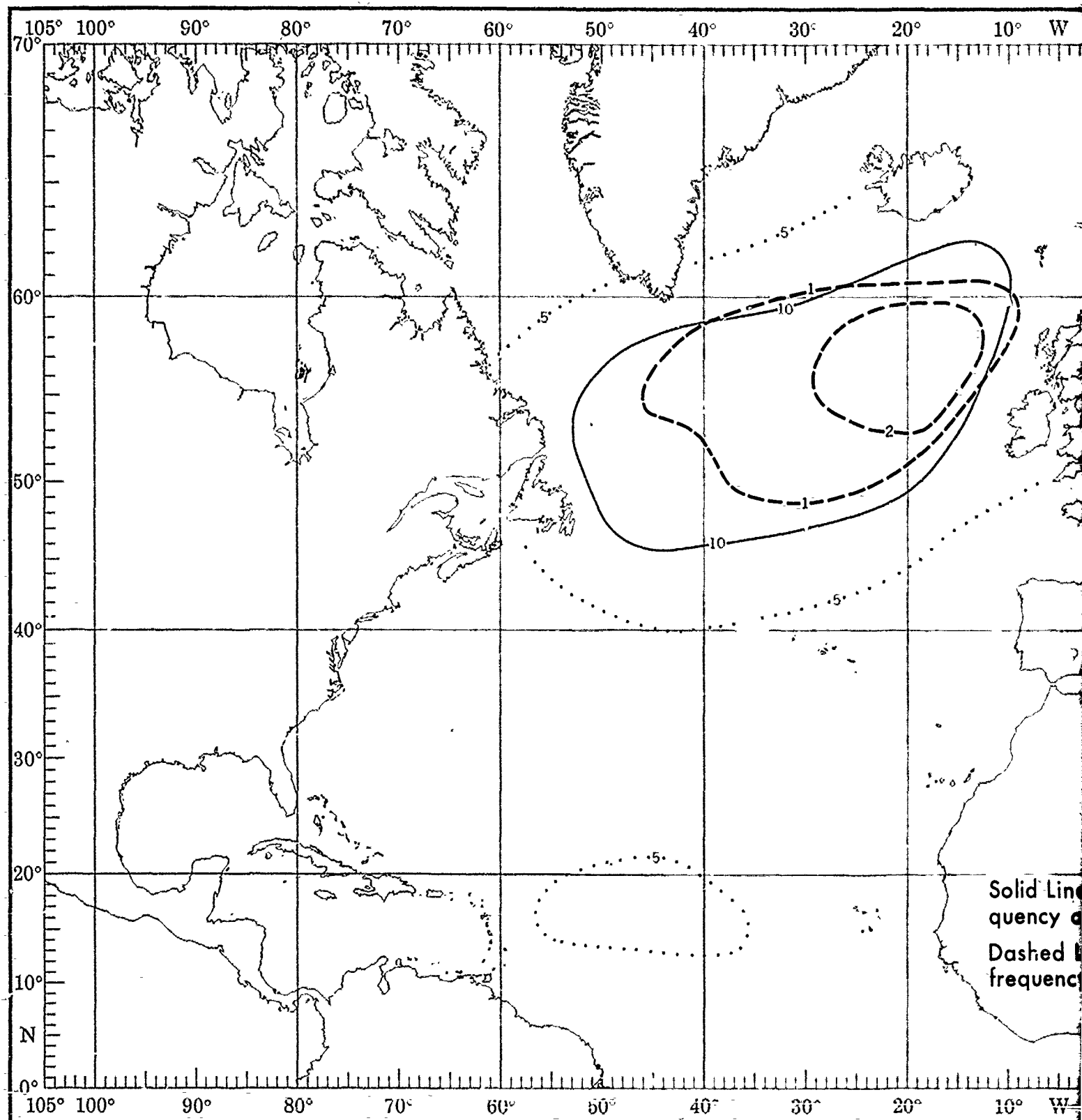
MAY



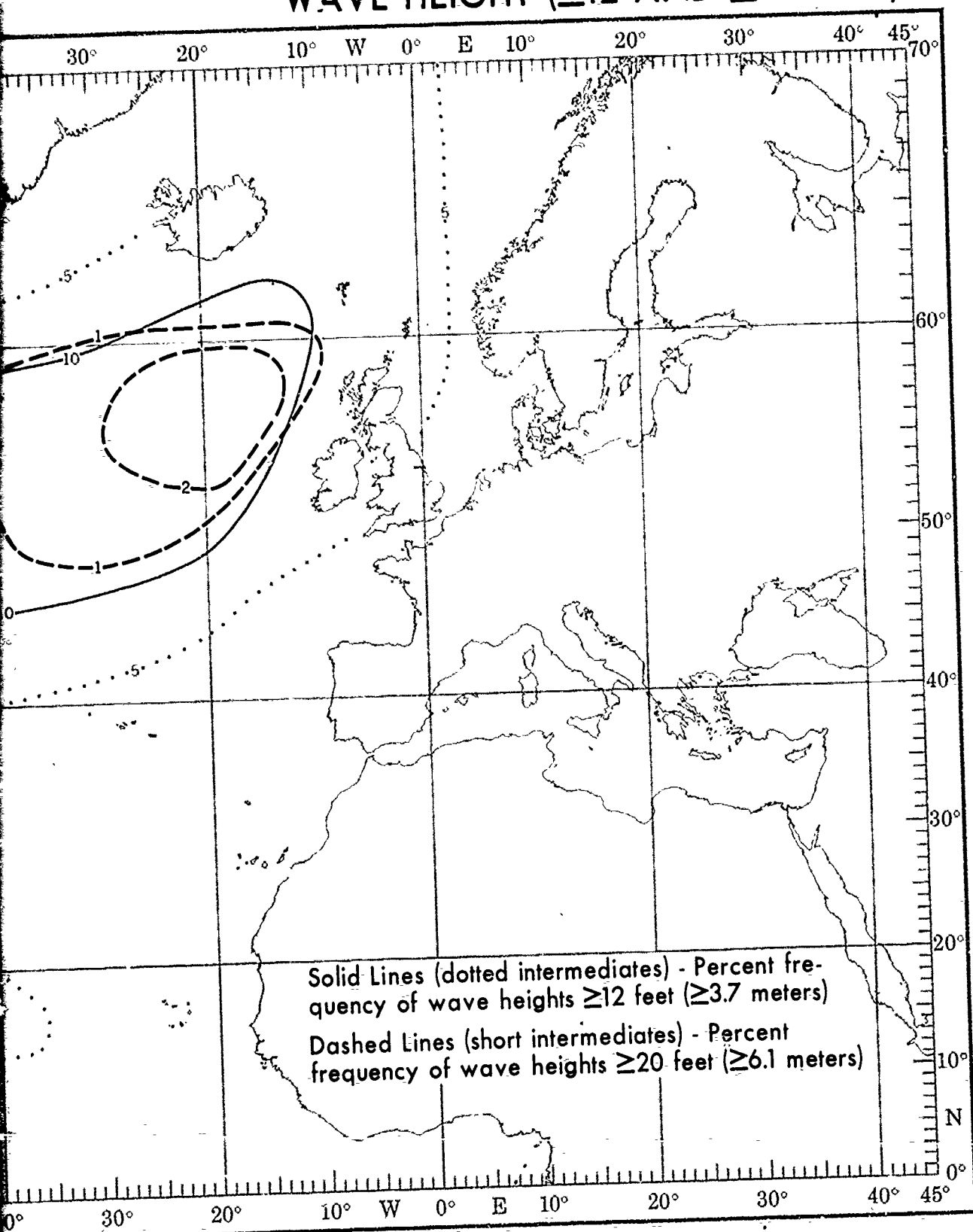
Solid Lines (dotted intermediates) - Percent frequency of wave heights  $\geq 12$  feet ( $\geq 3.7$  meters)  
 Dashed Lines (short intermediates) - Percent frequency of wave heights  $\geq 20$  feet ( $\geq 6.1$  meters)

# JUNE

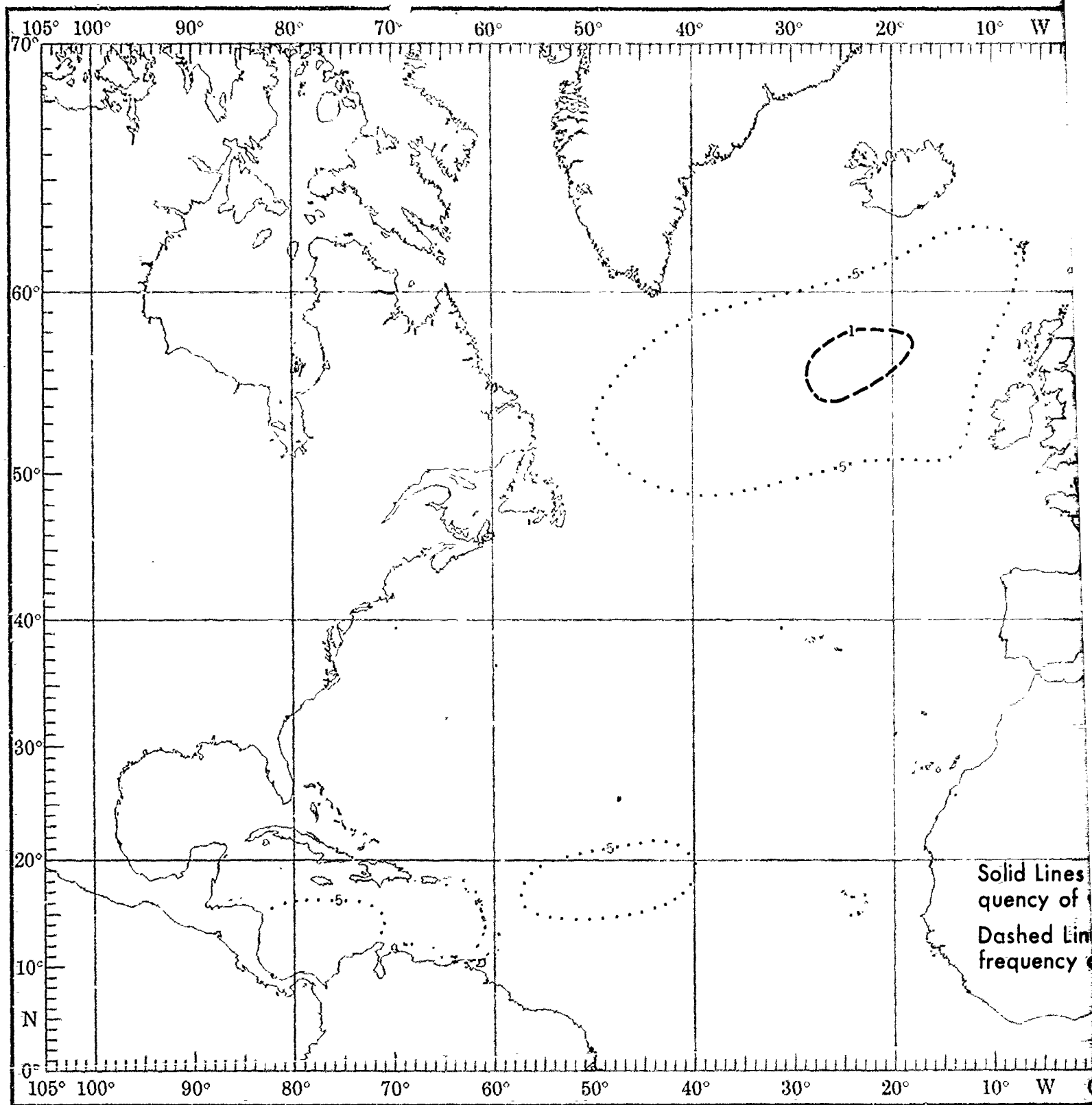
# WAVE



# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)

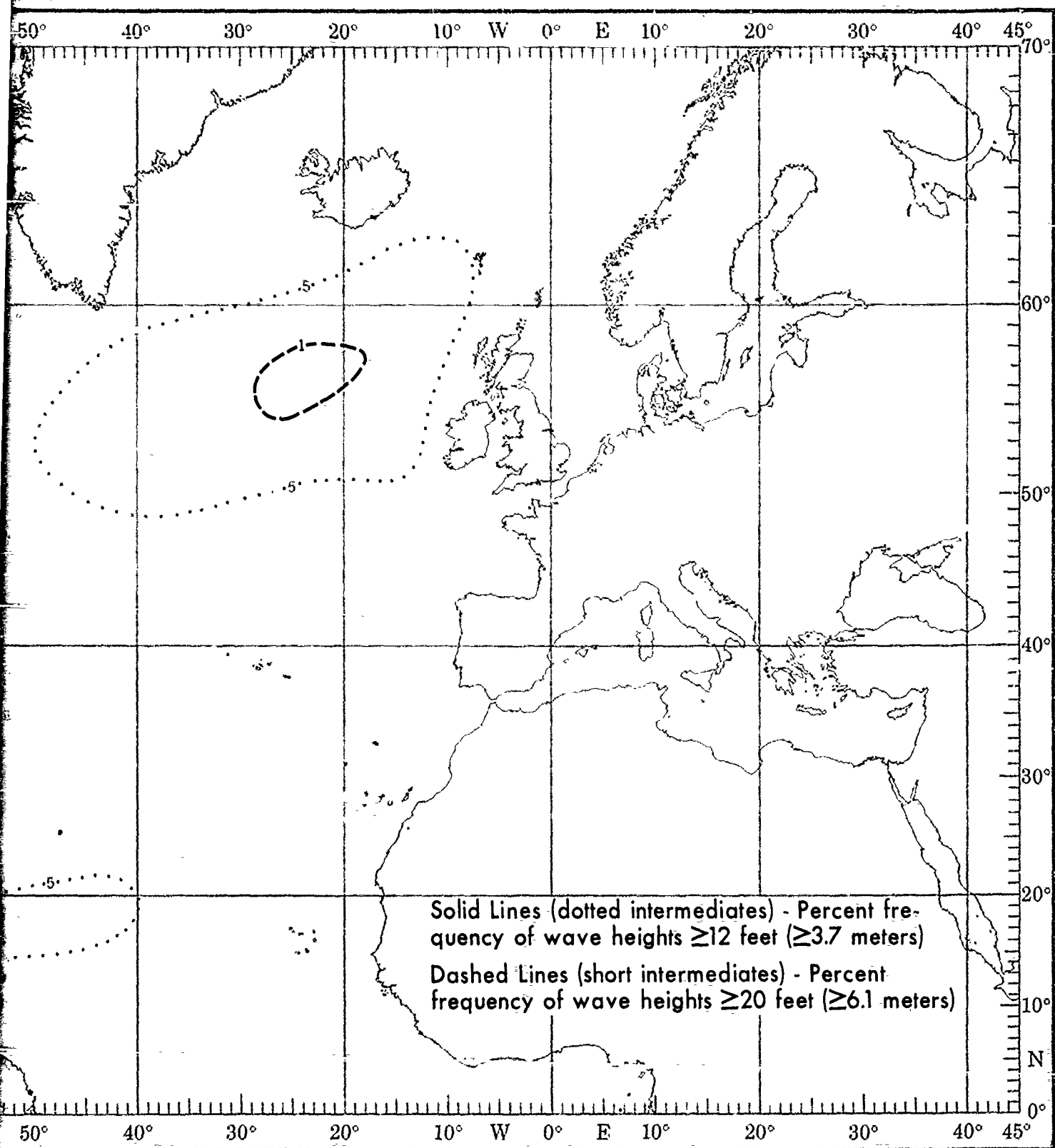


# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)



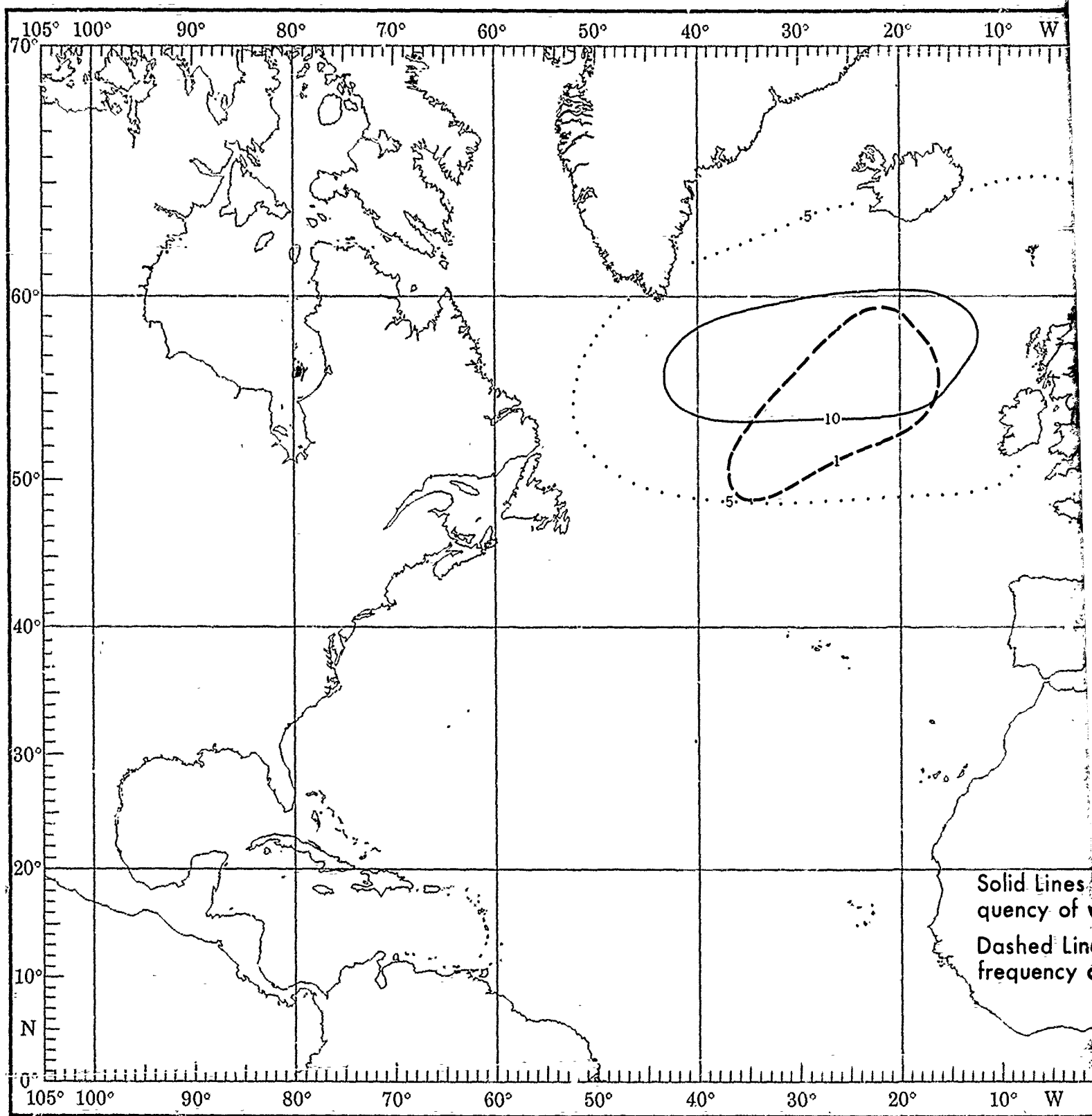
ET)

JULY



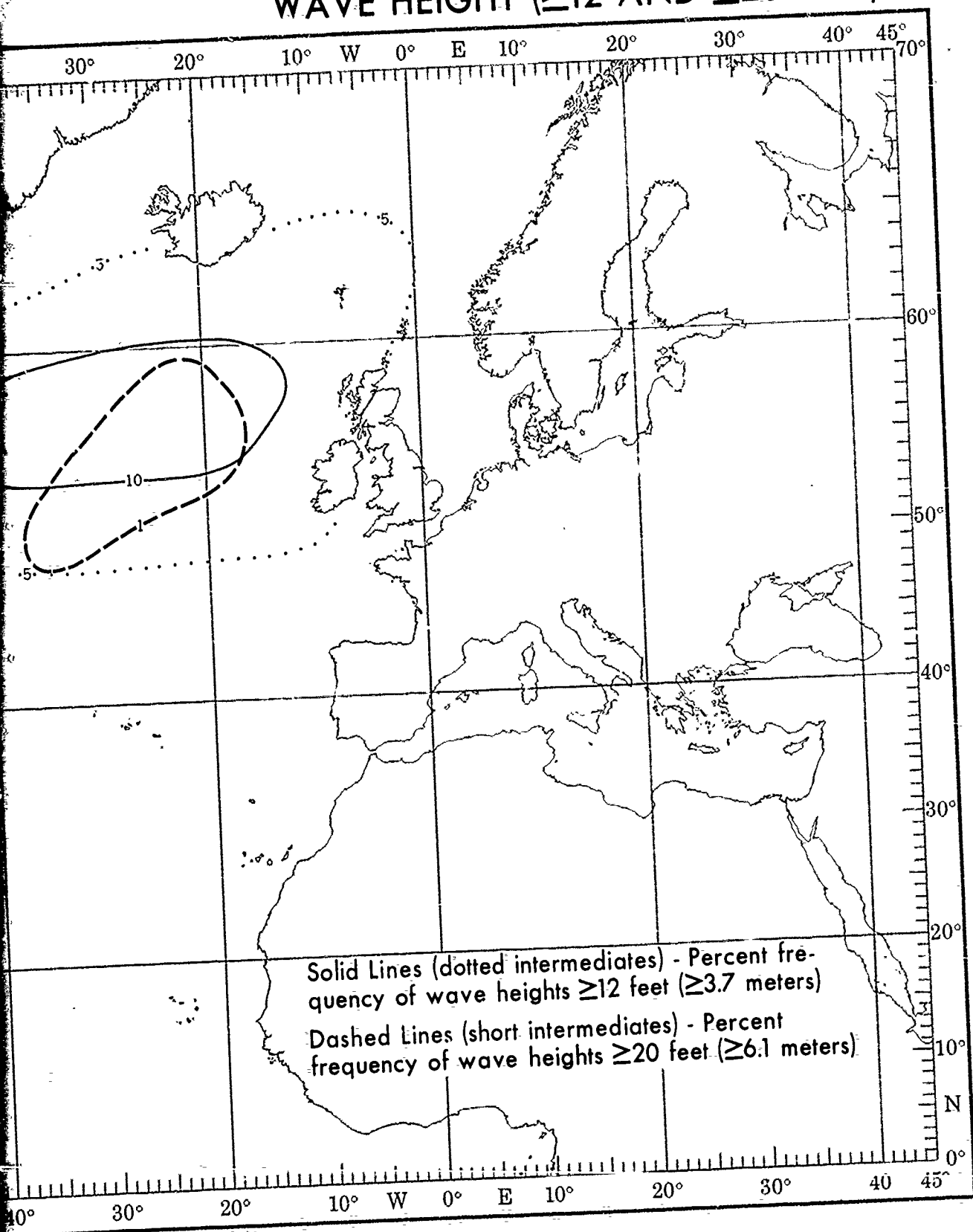
AUGUST

WAVE

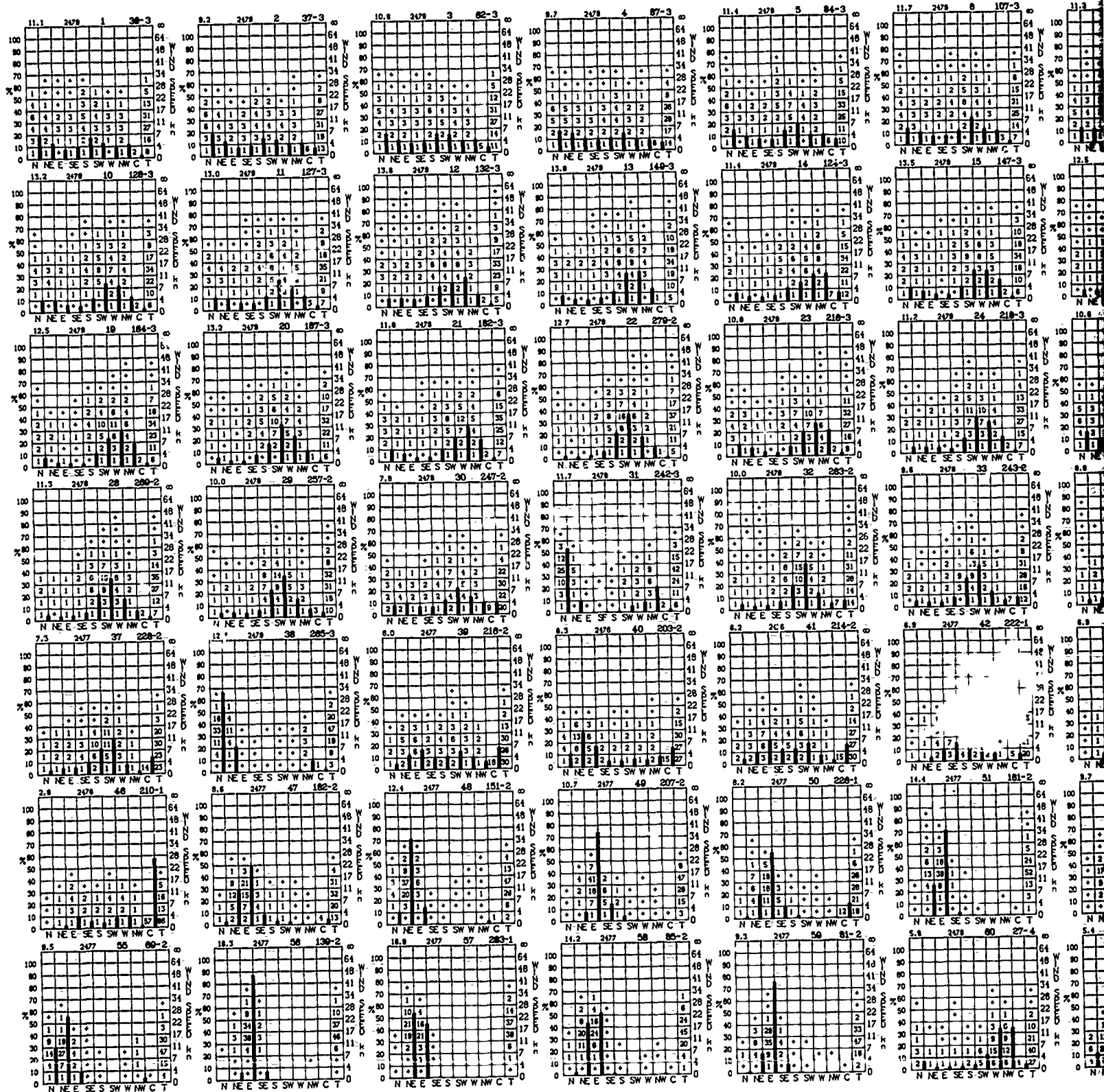




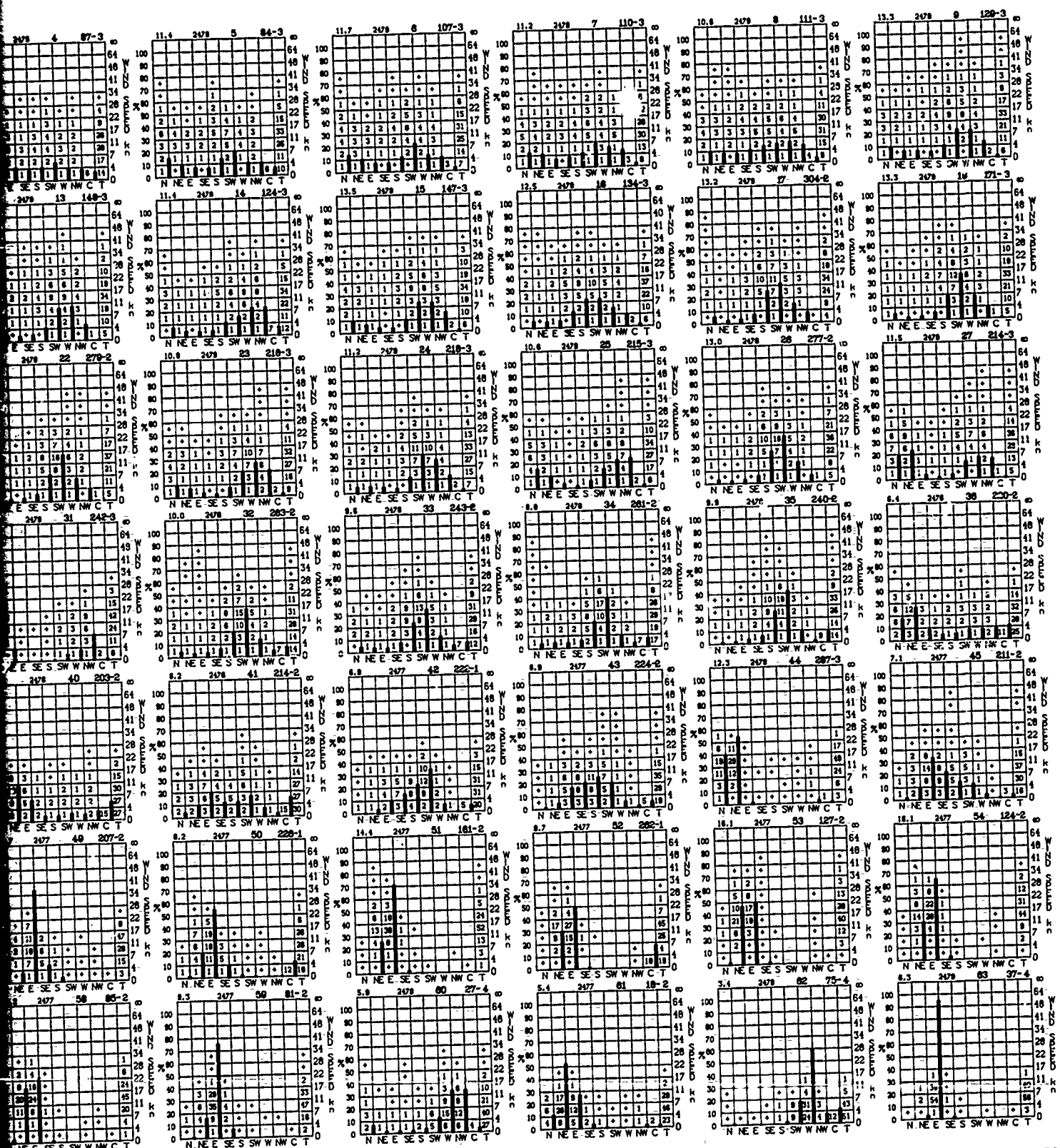
# WAVE HEIGHT ( $\geq 12$ AND $\geq 20$ FEET)



# WIND DIRECTION AND SPEED



# JULY



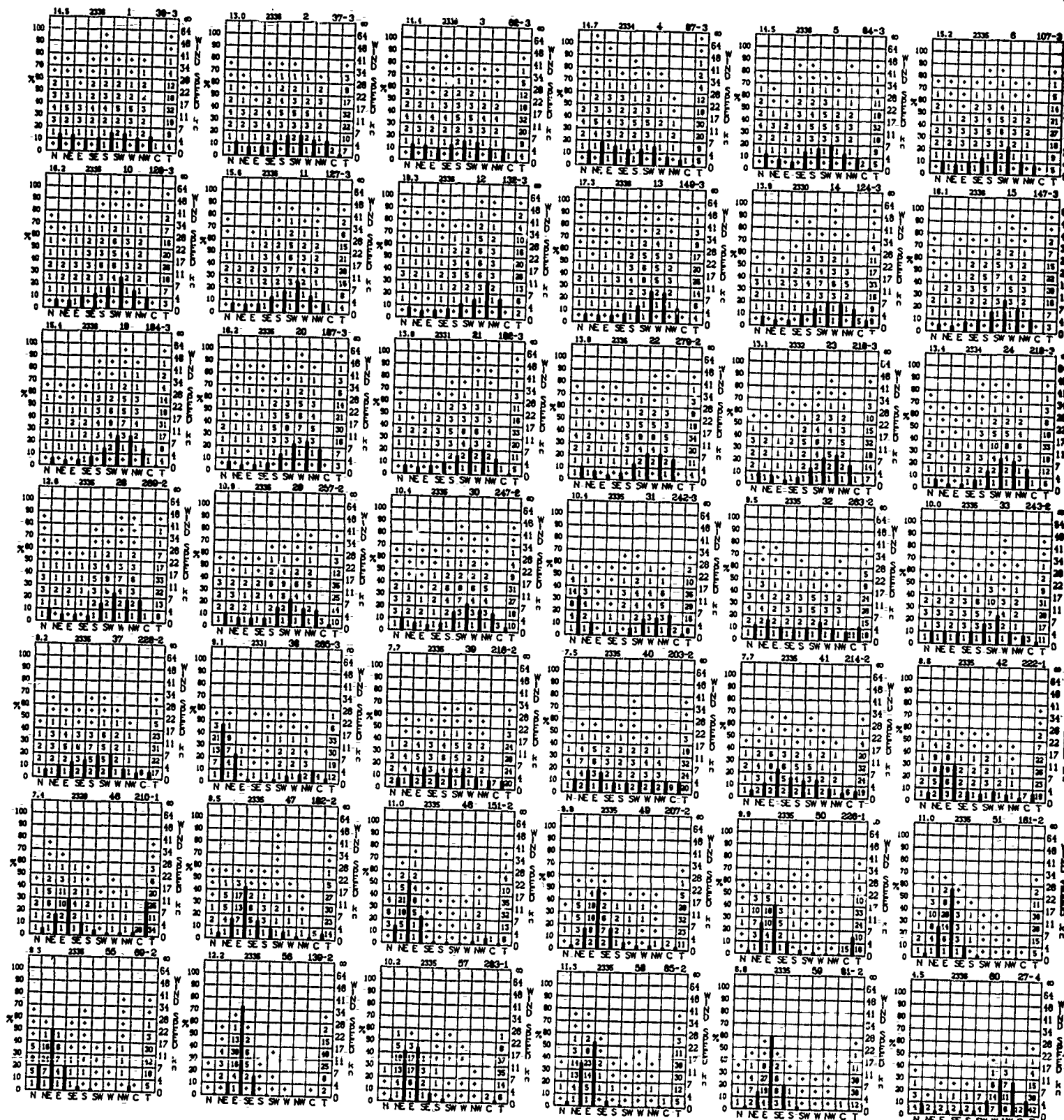
## WILL



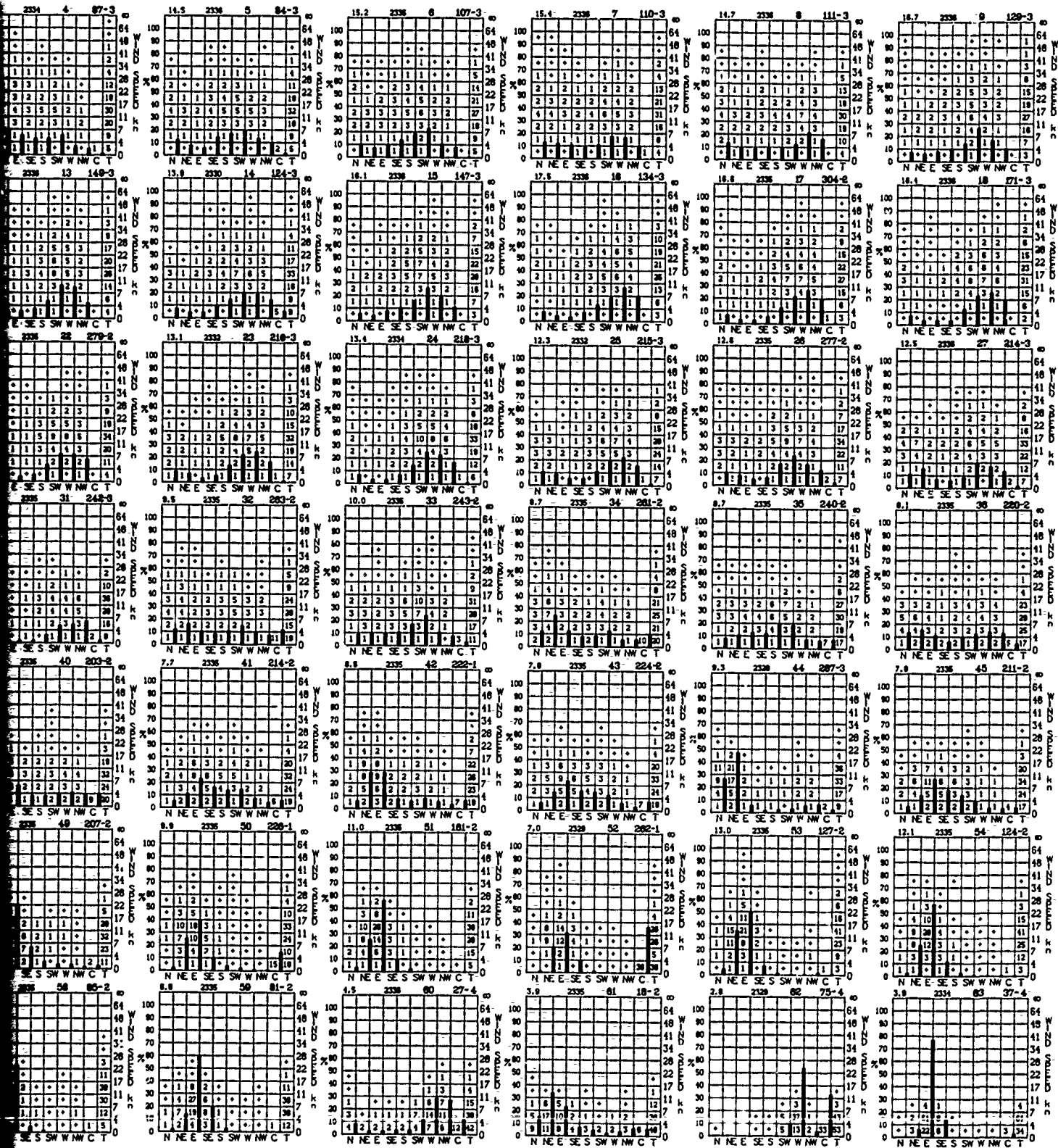
②



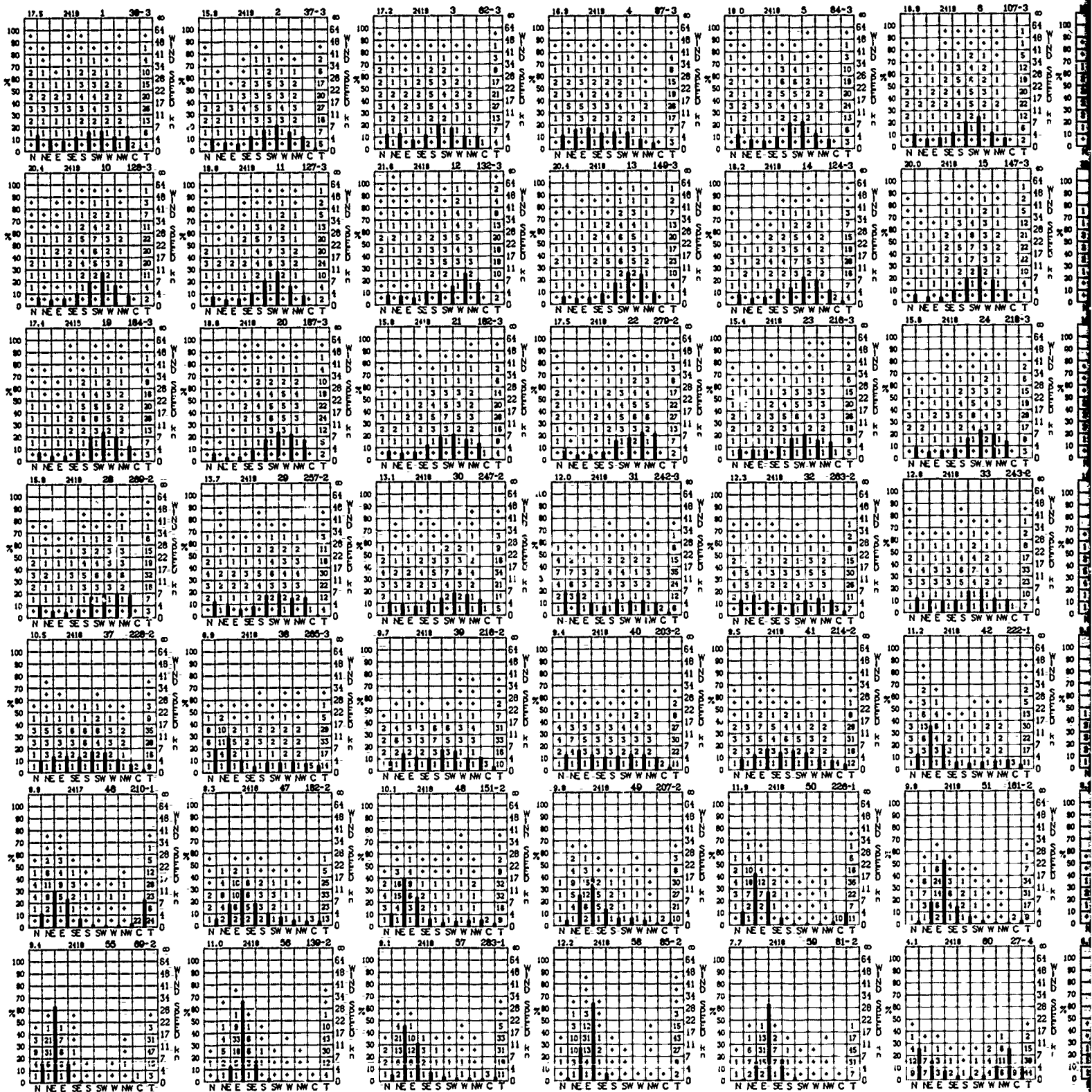
# WIND DIRECTION AND SPEED



# SEPTEMBER

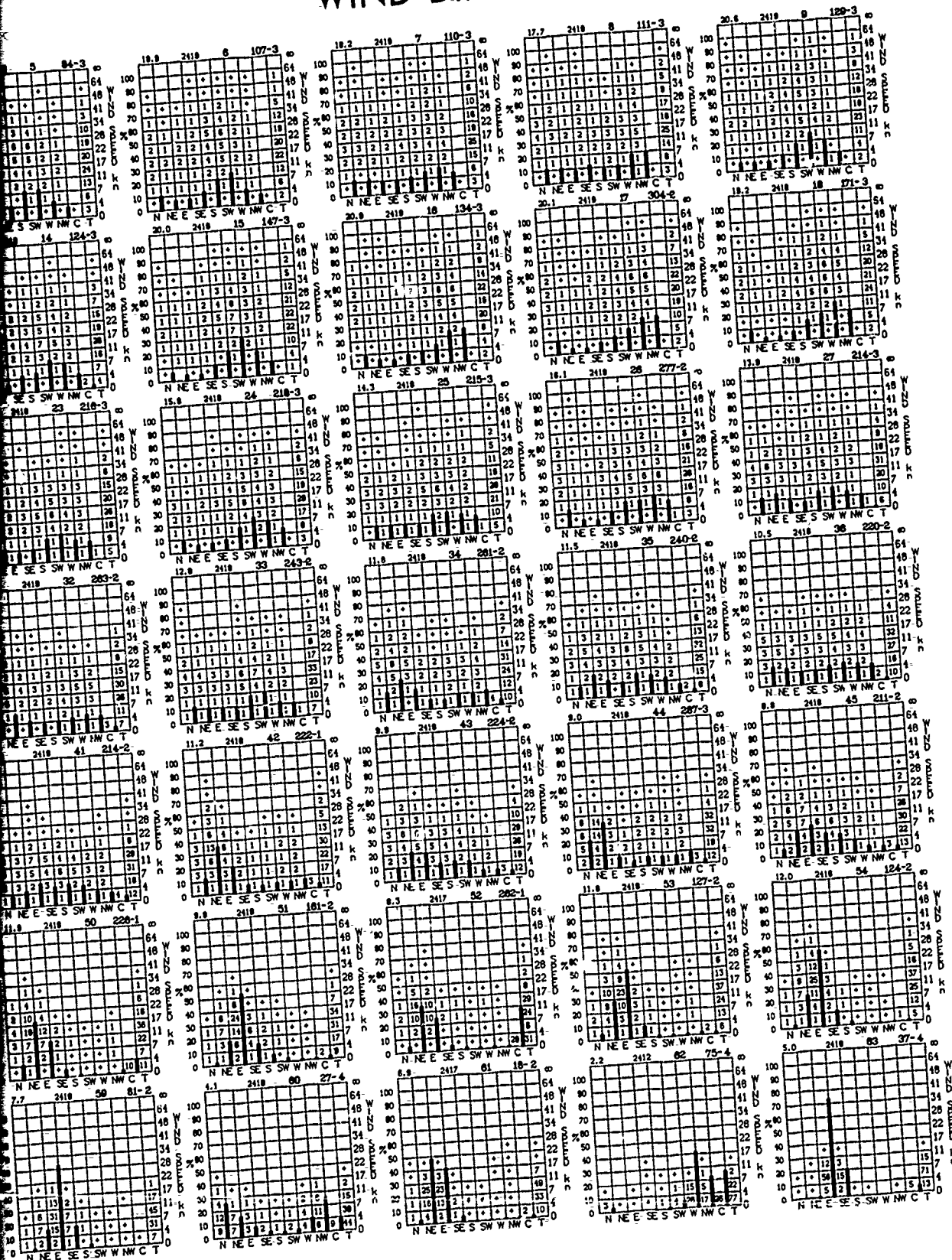


# OCTOBER

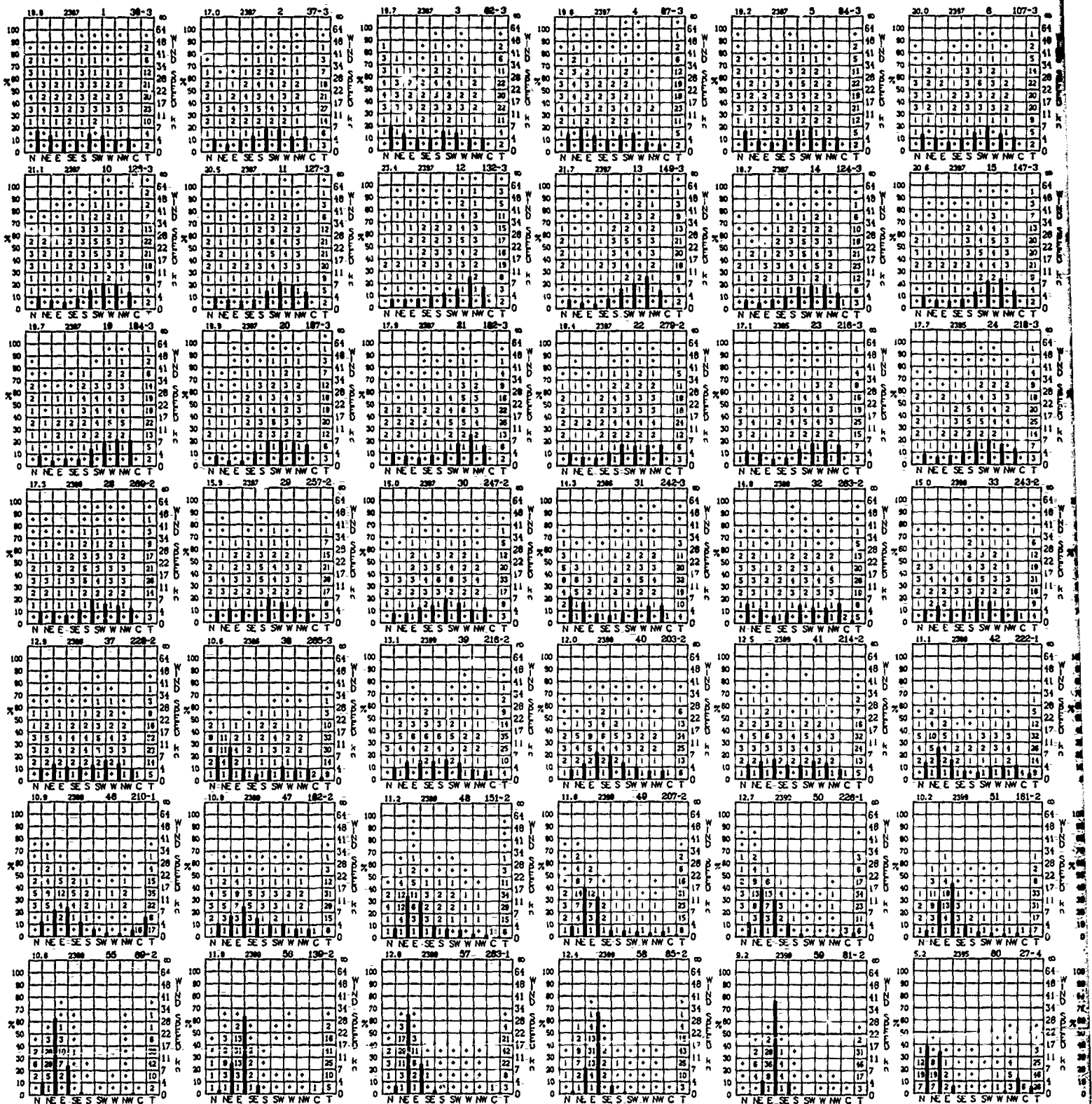




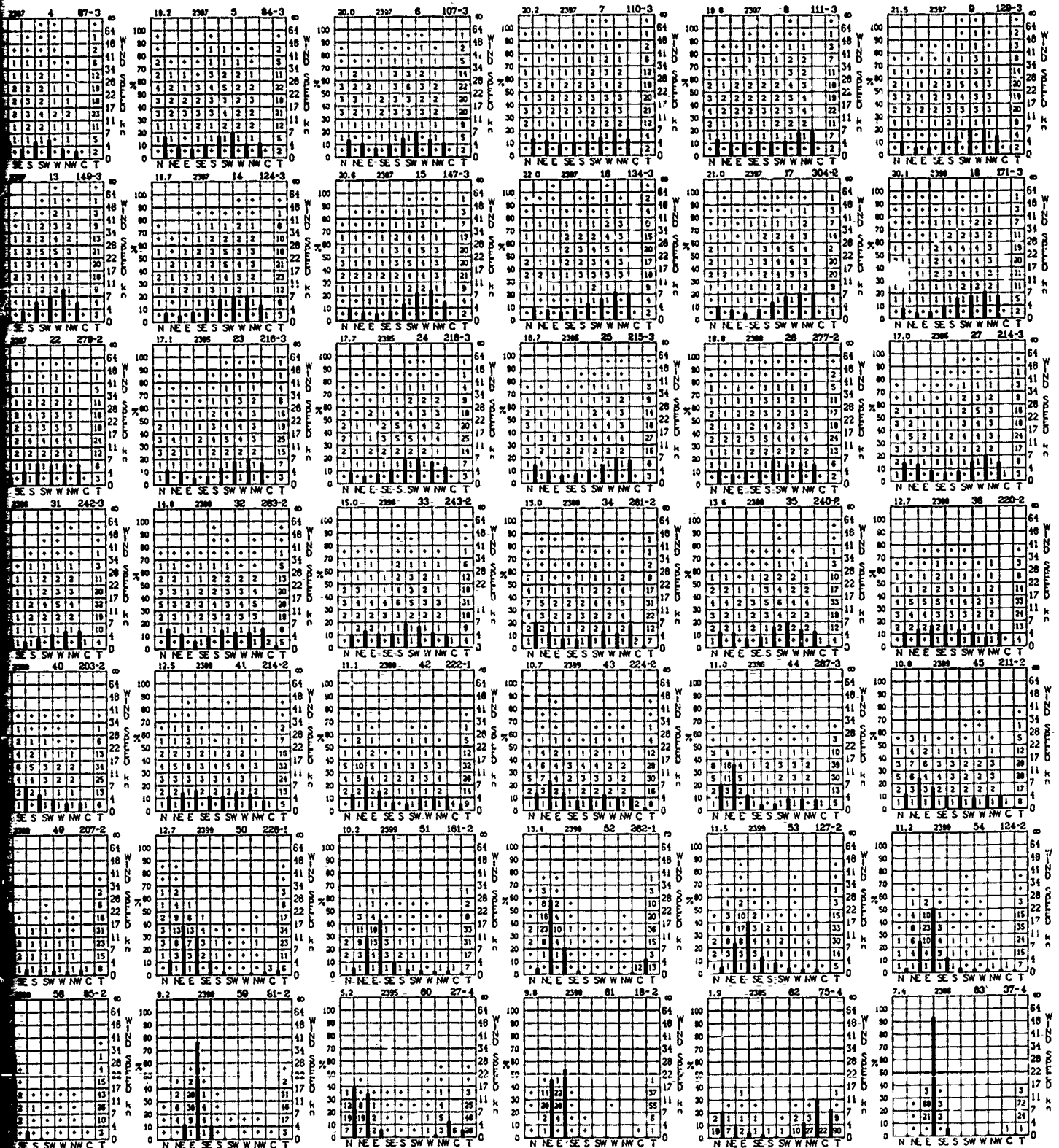
# WIND DIRECTION AND SPEED



# WIND DIRECTION AND SPEED

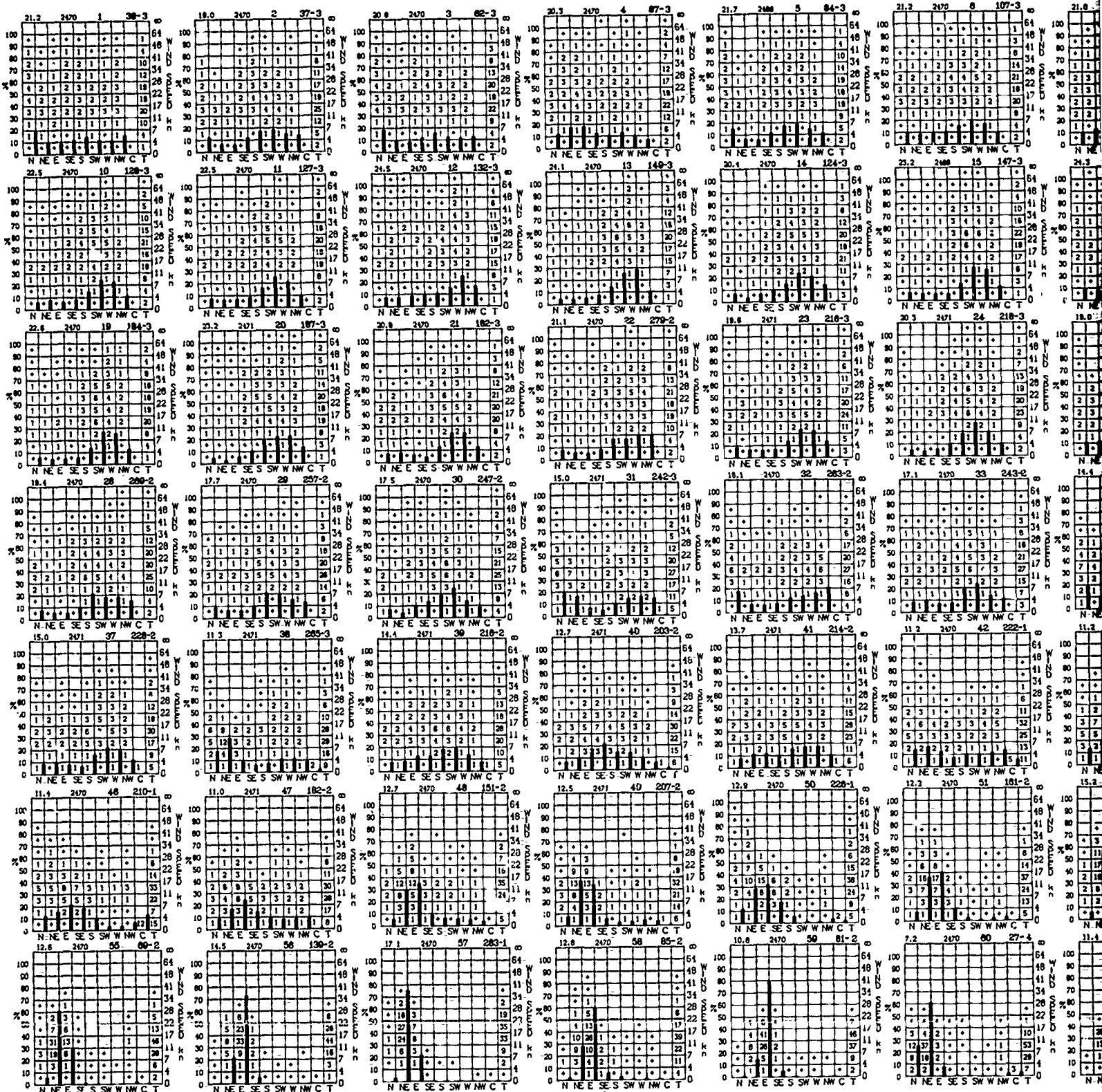


# NOVEMBER



# DECEMBER

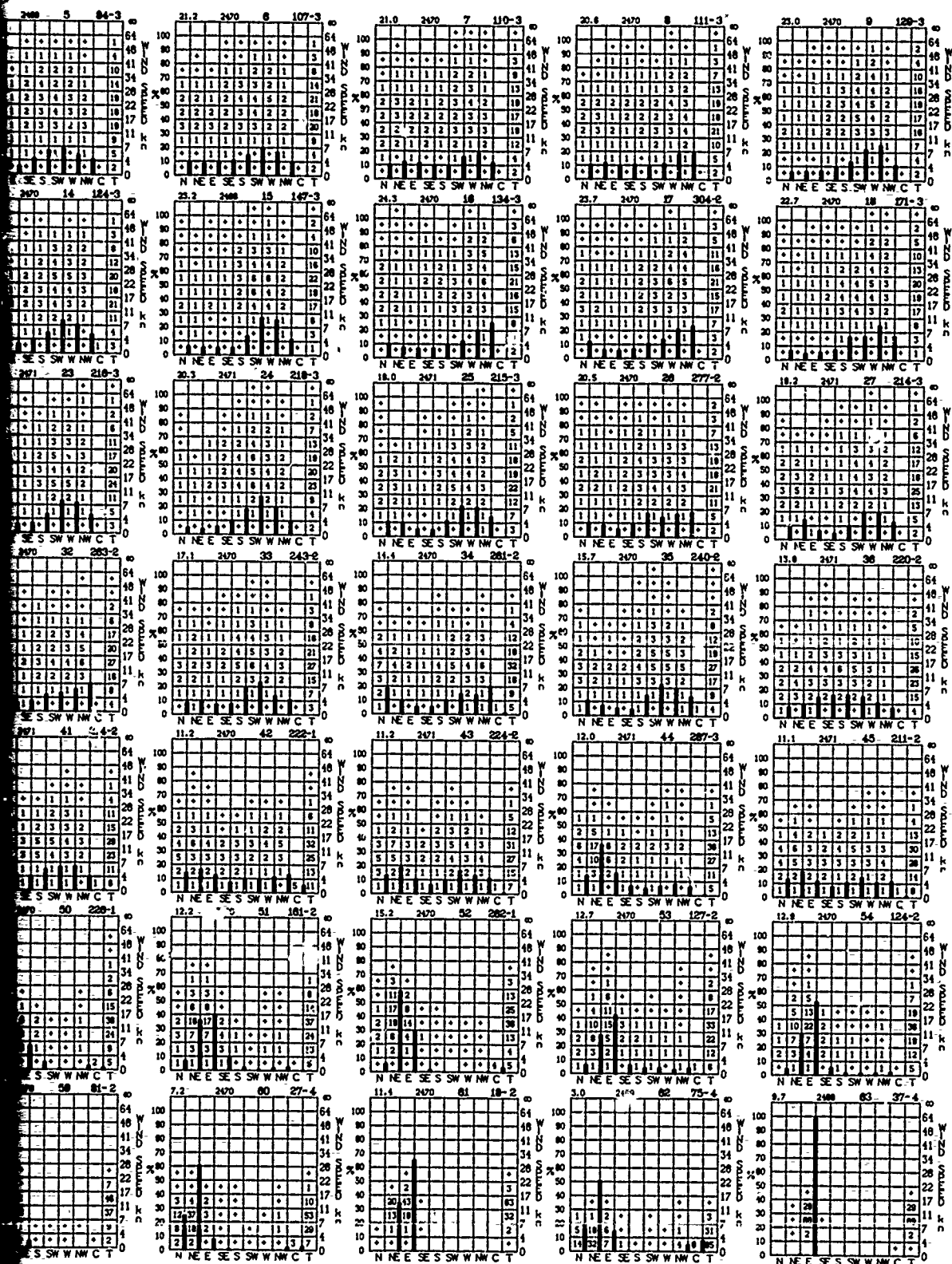
WI



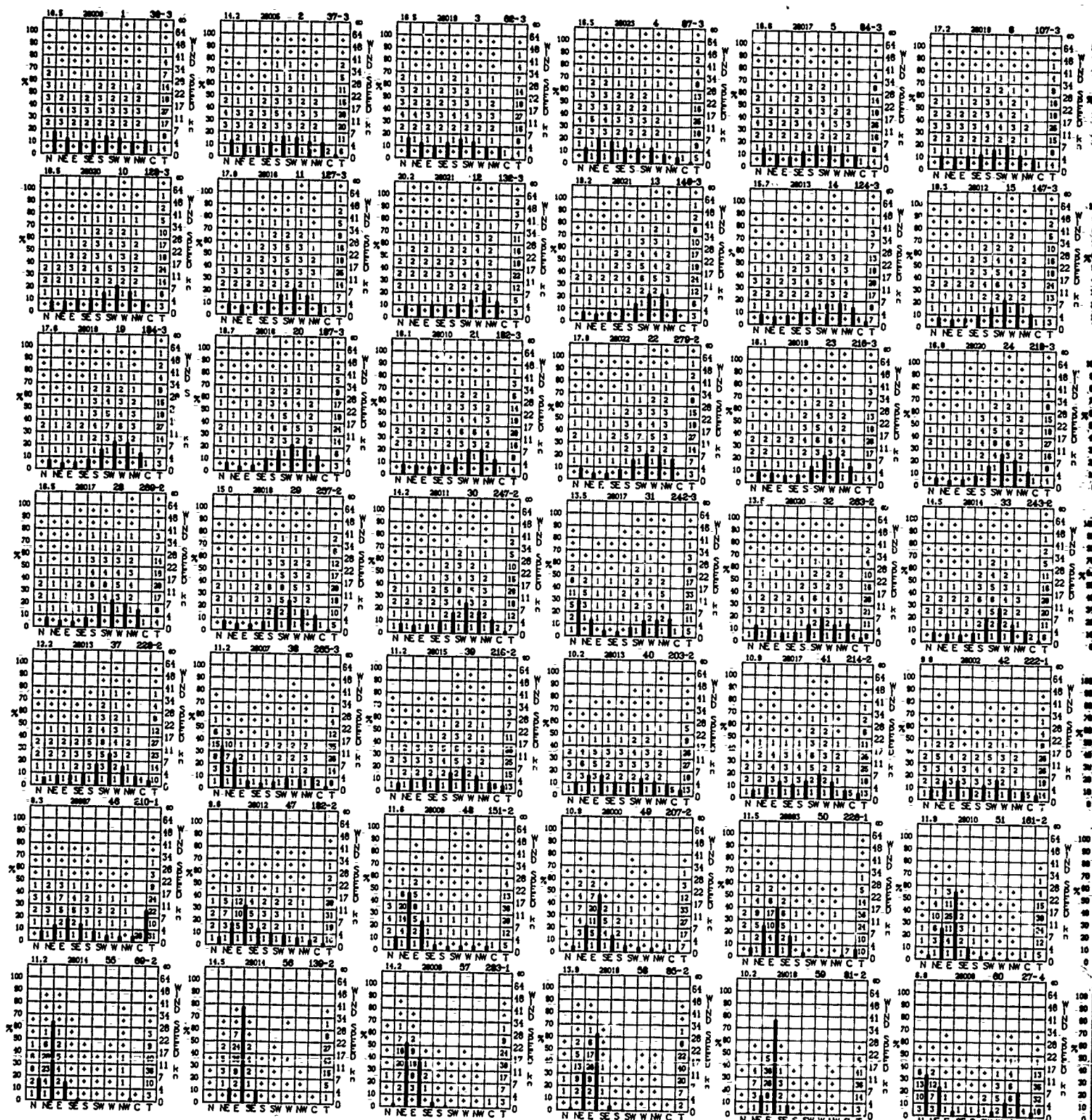
①



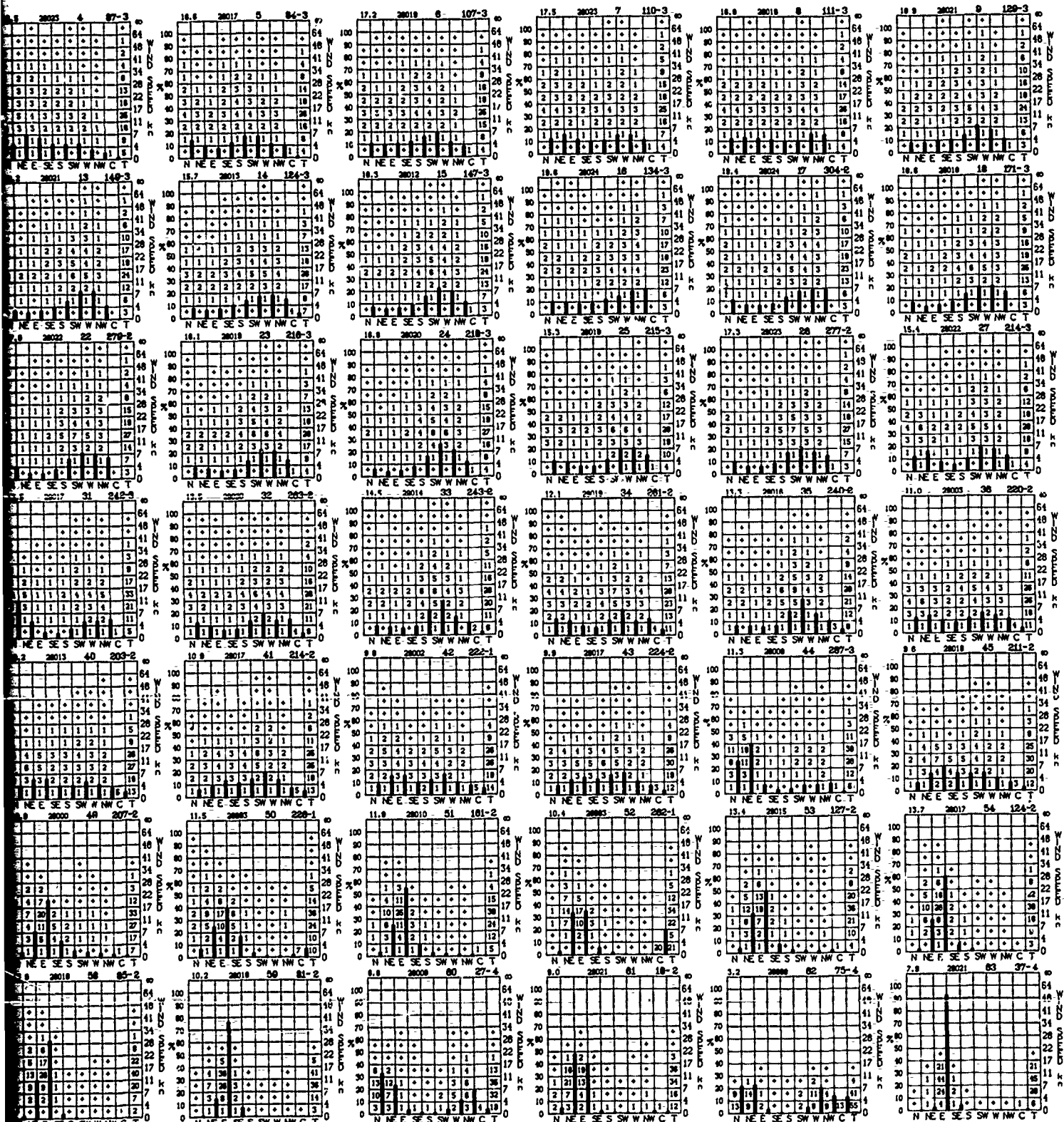
# WIND DIRECTION AND SPEED



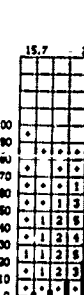
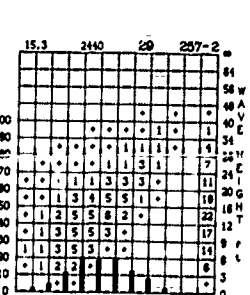
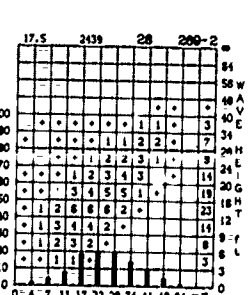
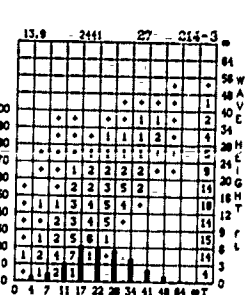
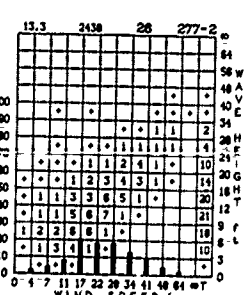
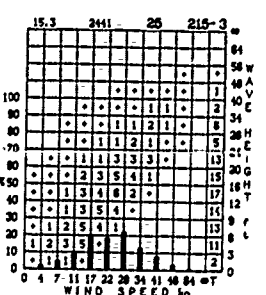
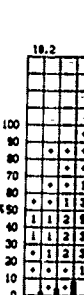
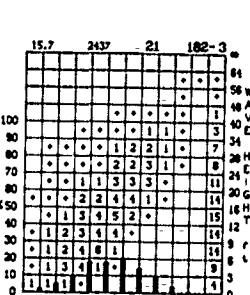
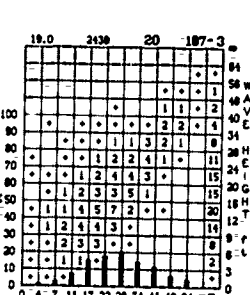
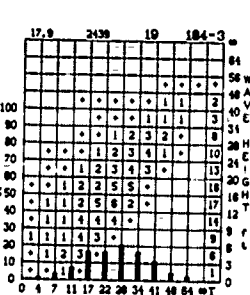
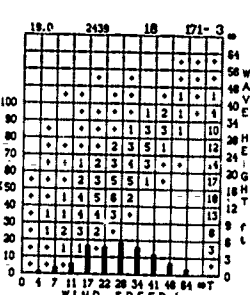
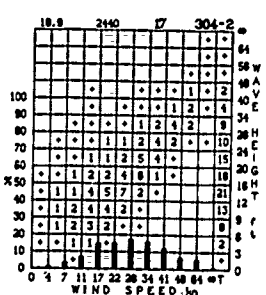
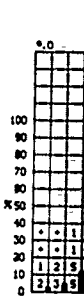
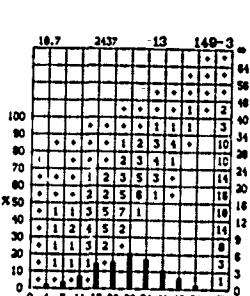
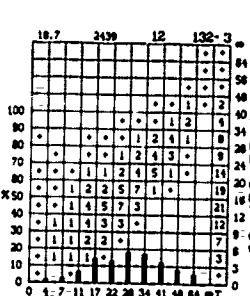
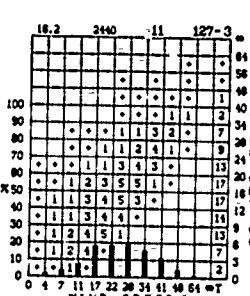
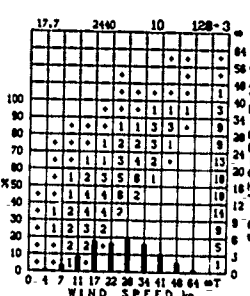
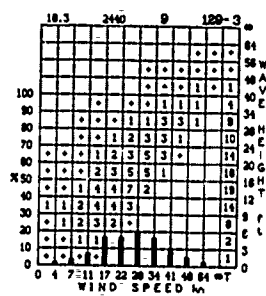
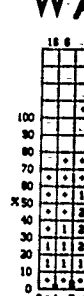
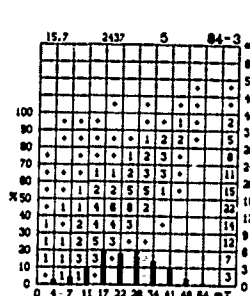
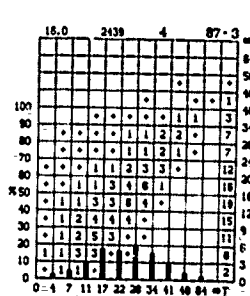
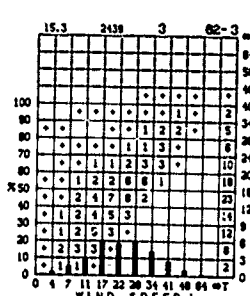
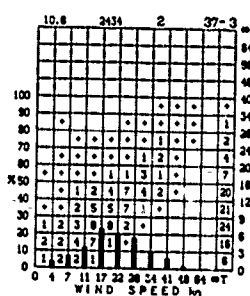
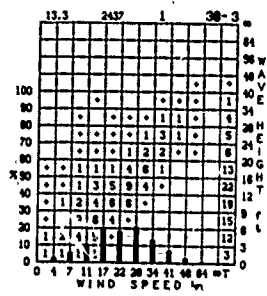
# WIND DIRECTION AND SPEED



# ANNUAL

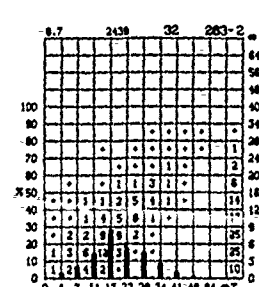
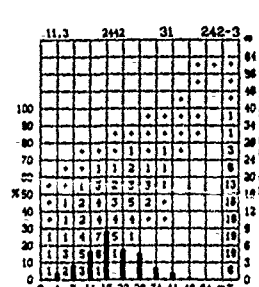
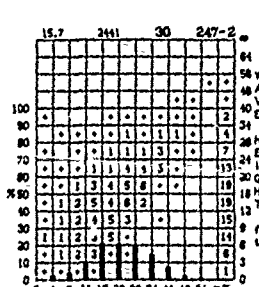
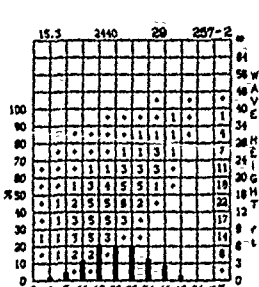
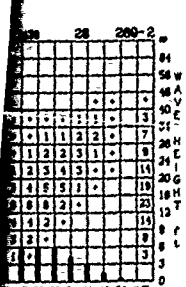
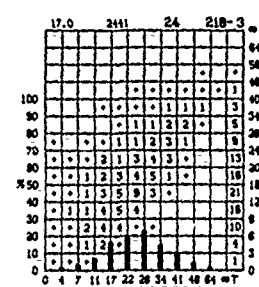
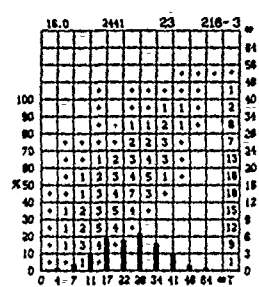
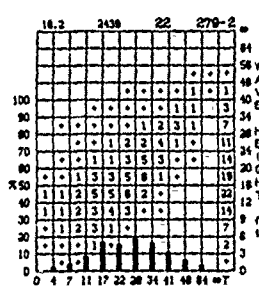
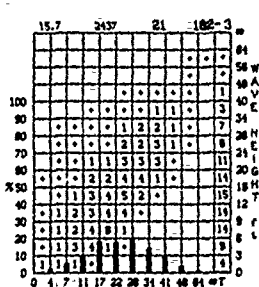
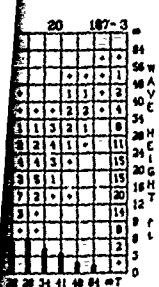
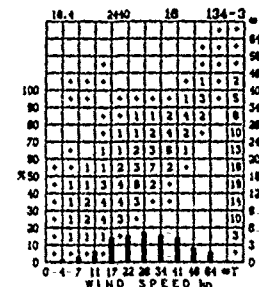
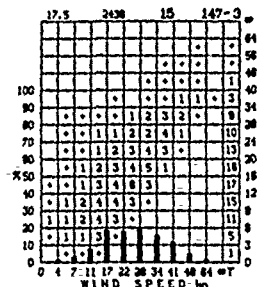
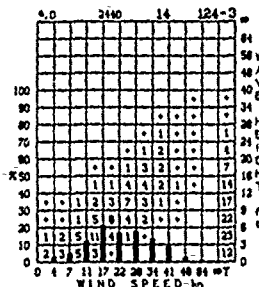
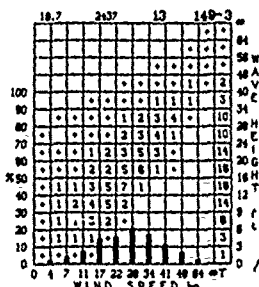
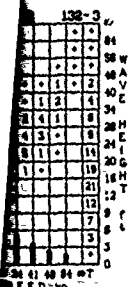
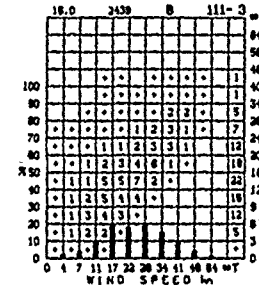
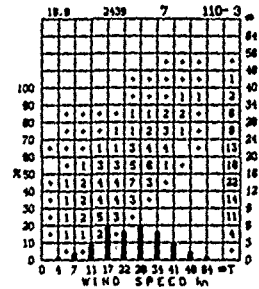
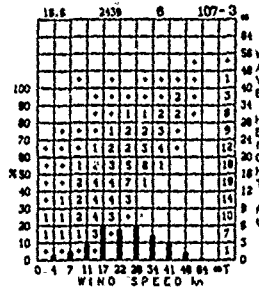
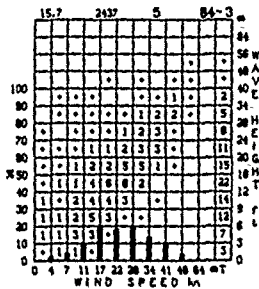


# JANUARY

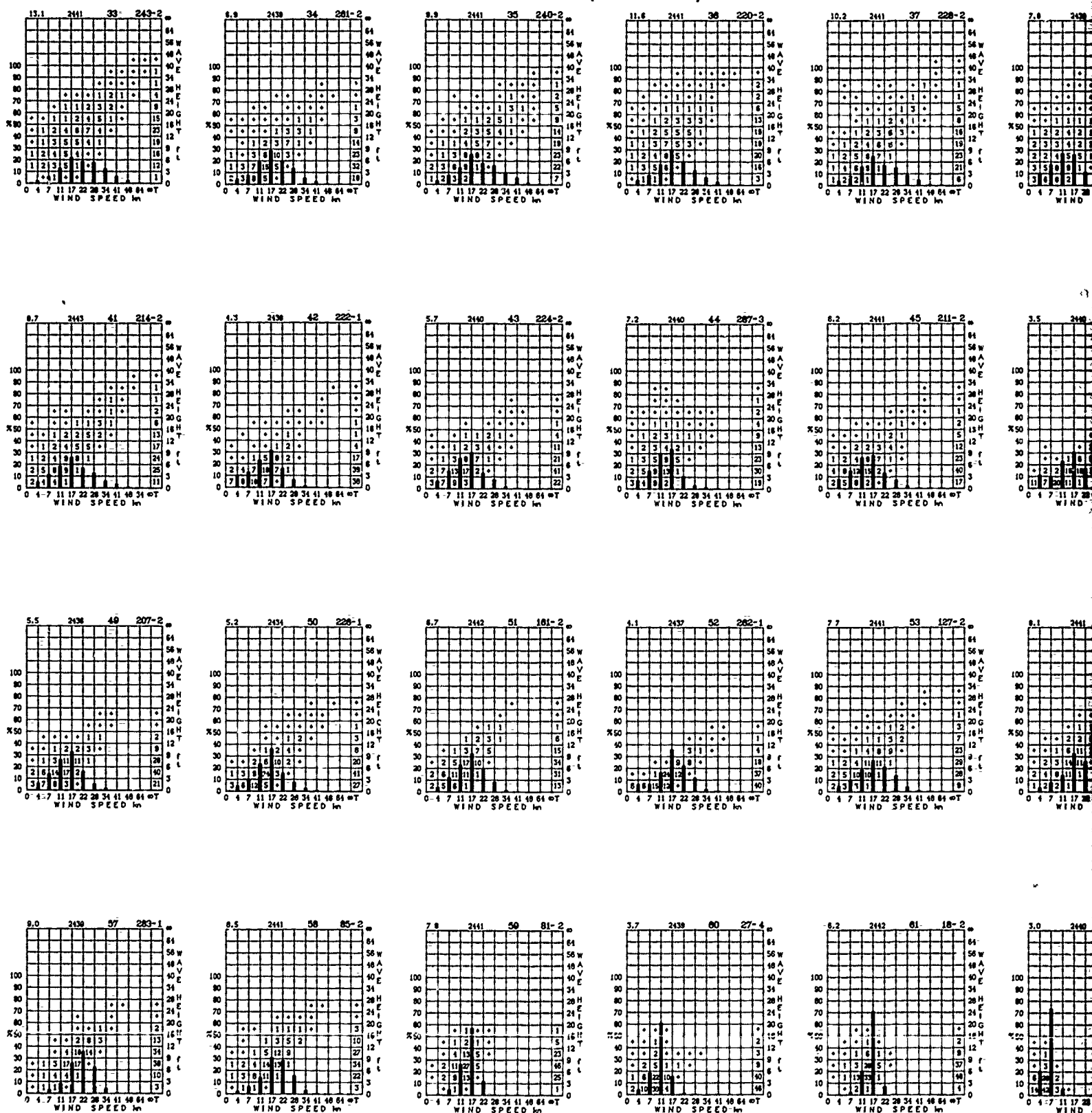




# WAVE HEIGHT AND WIND SPEED

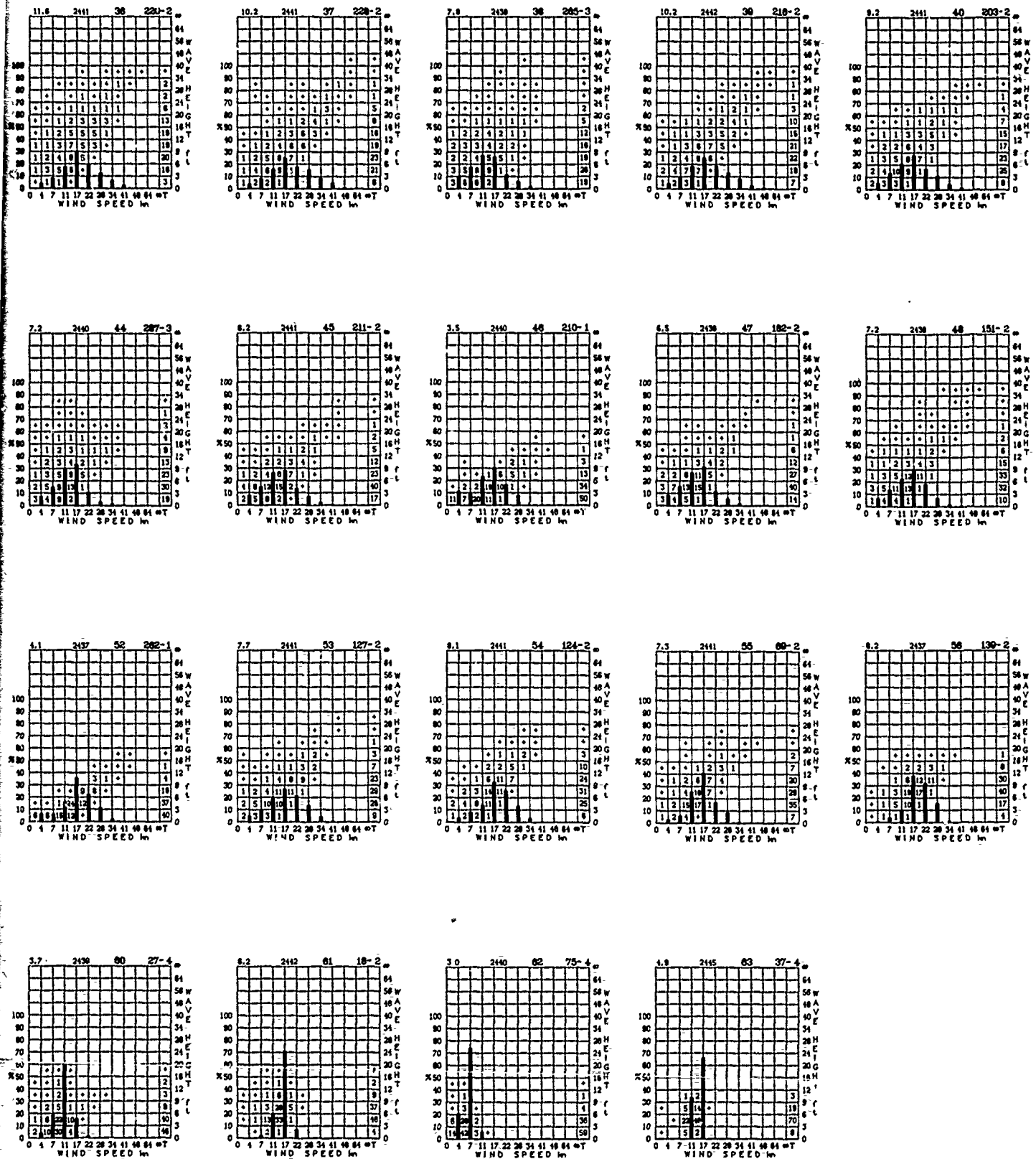


# WAVE HEIGHT AND WIND SPEED (Cont'd)



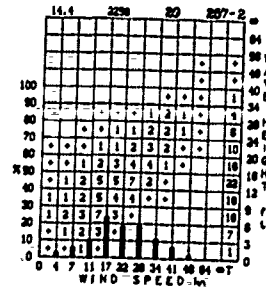
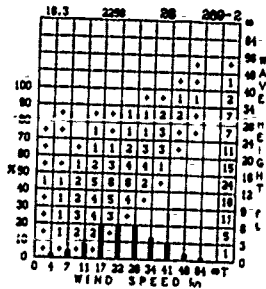
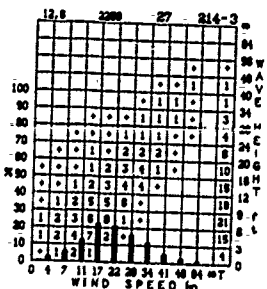
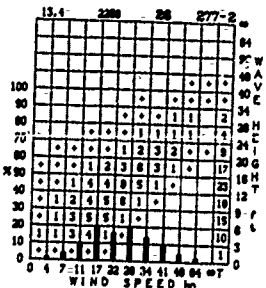
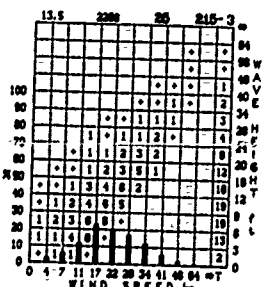
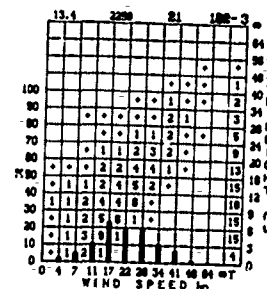
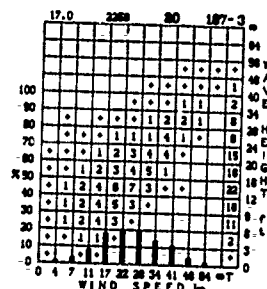
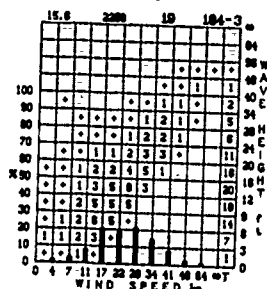
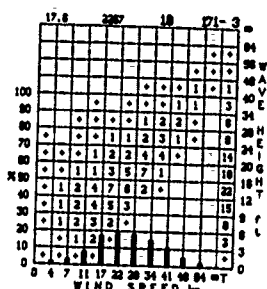
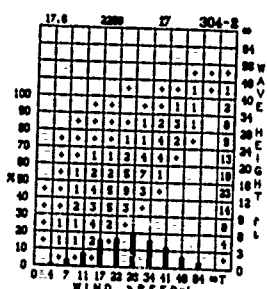
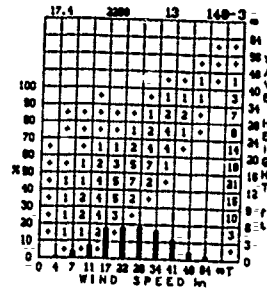
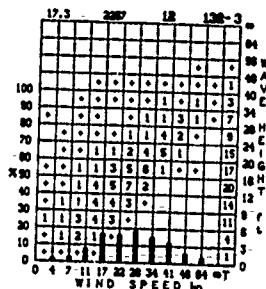
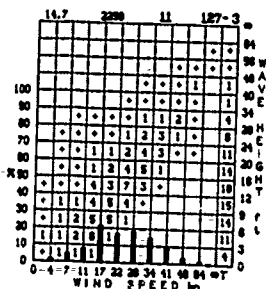
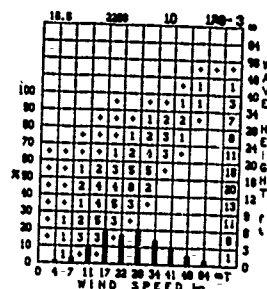
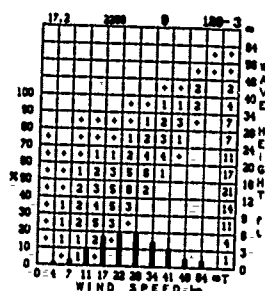
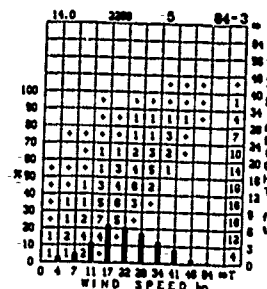
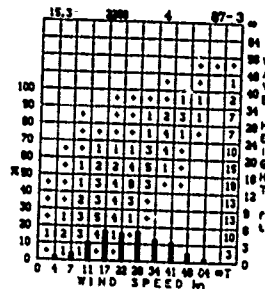
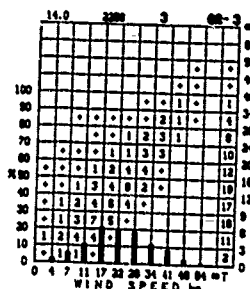
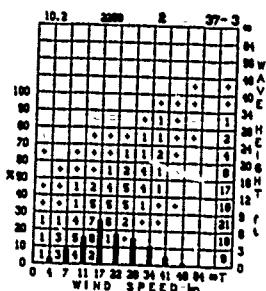
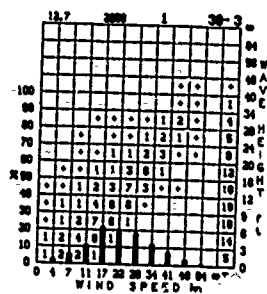
Cont'd)

JANUARY

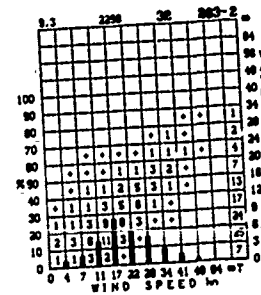
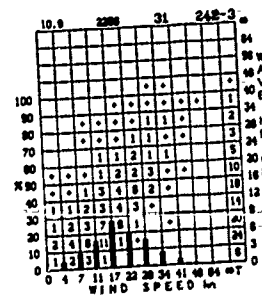
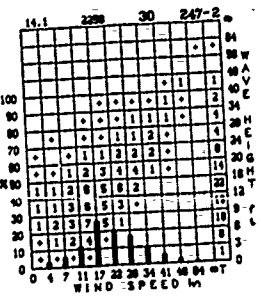
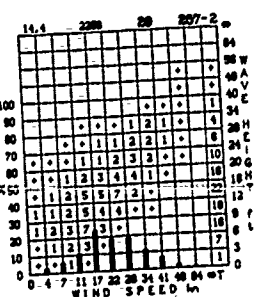
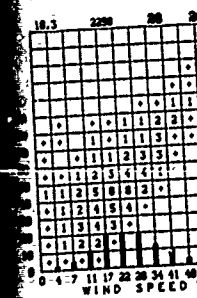
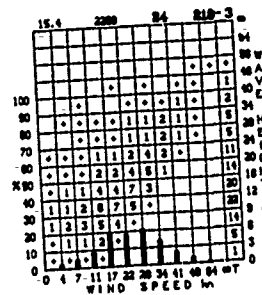
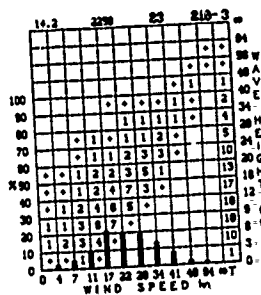
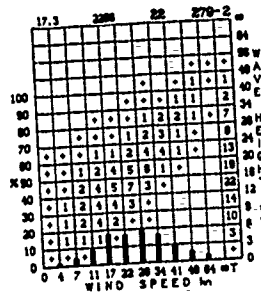
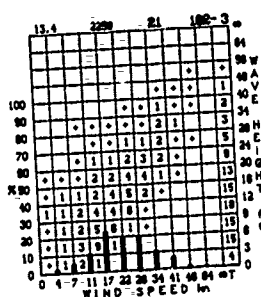
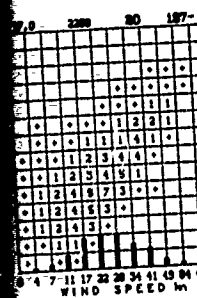
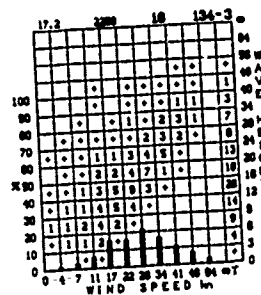
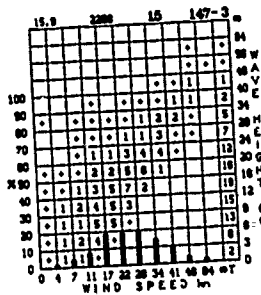
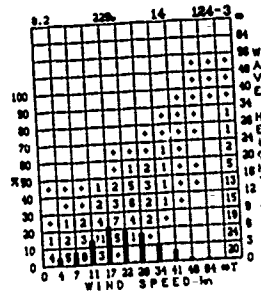
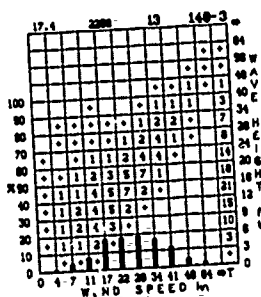
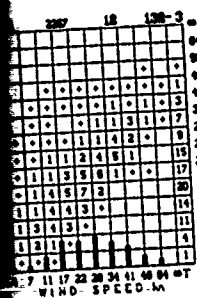
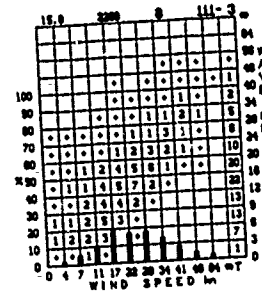
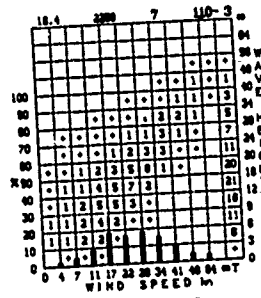
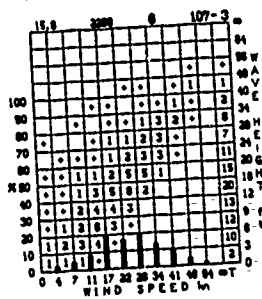
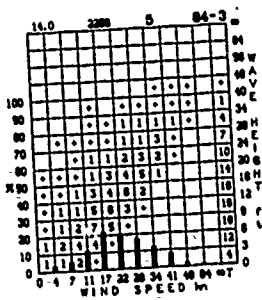
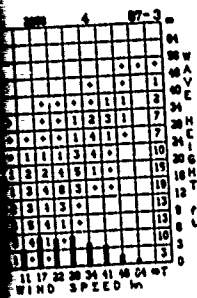


(2)

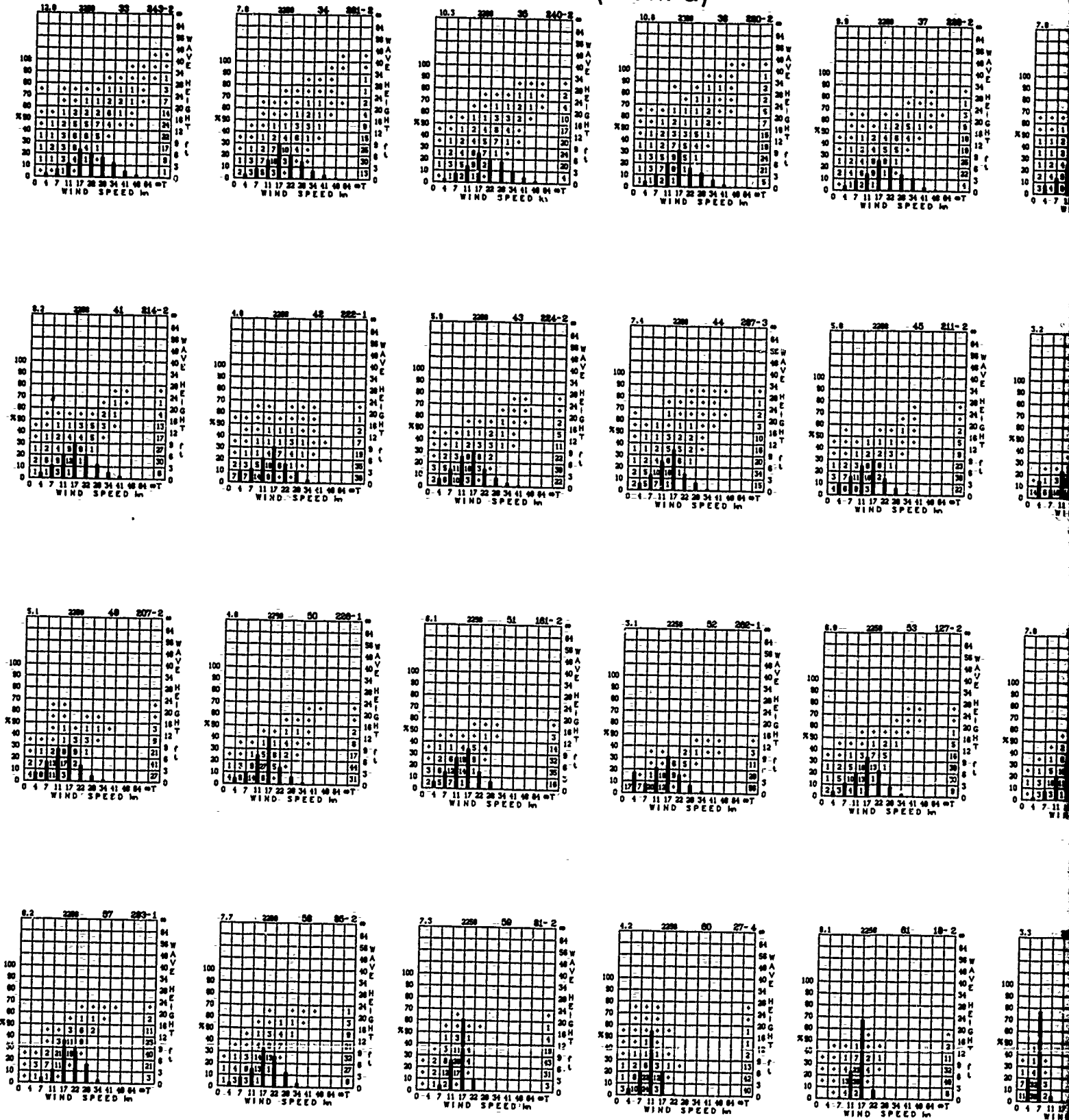
# FEBRUARY



# WAVE HEIGHT AND WIND SPEED



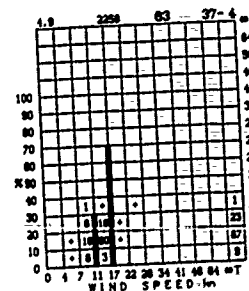
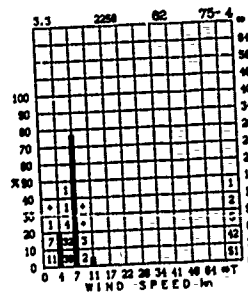
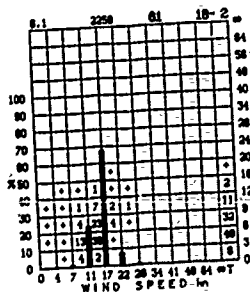
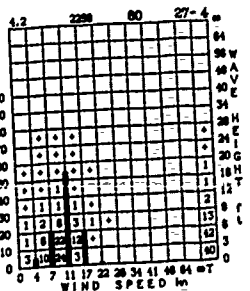
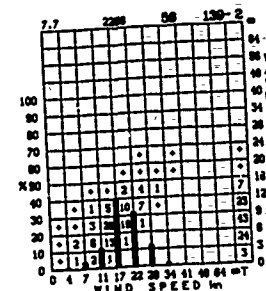
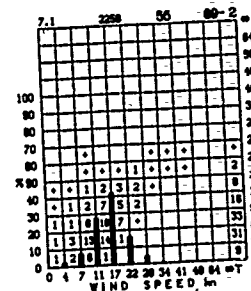
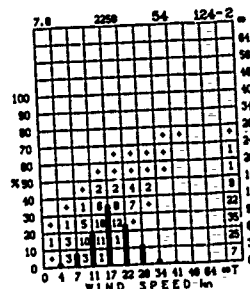
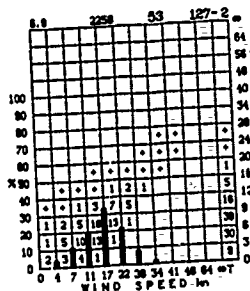
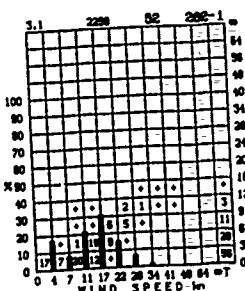
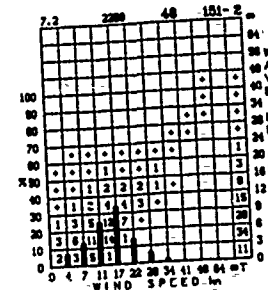
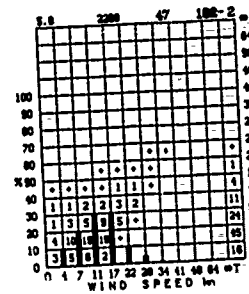
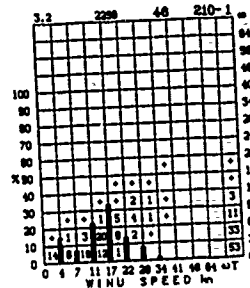
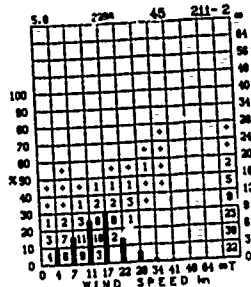
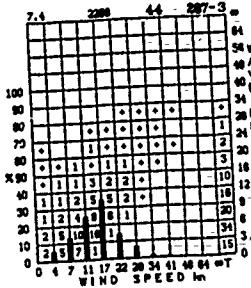
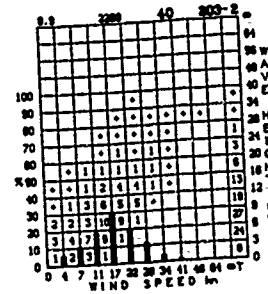
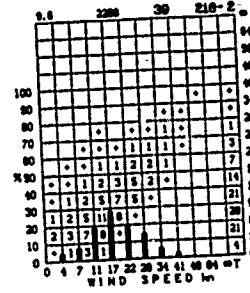
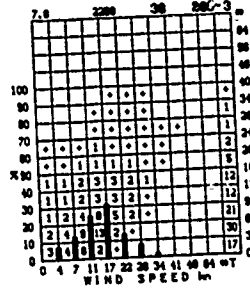
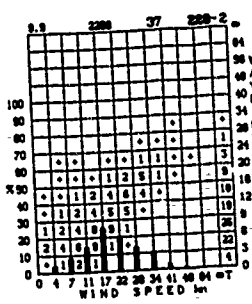
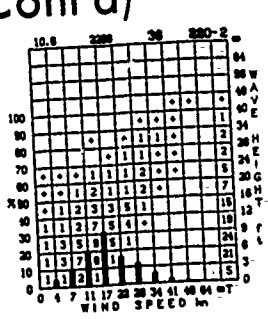
# WAVE HEIGHT AND WIND SPEED (Cont'd)



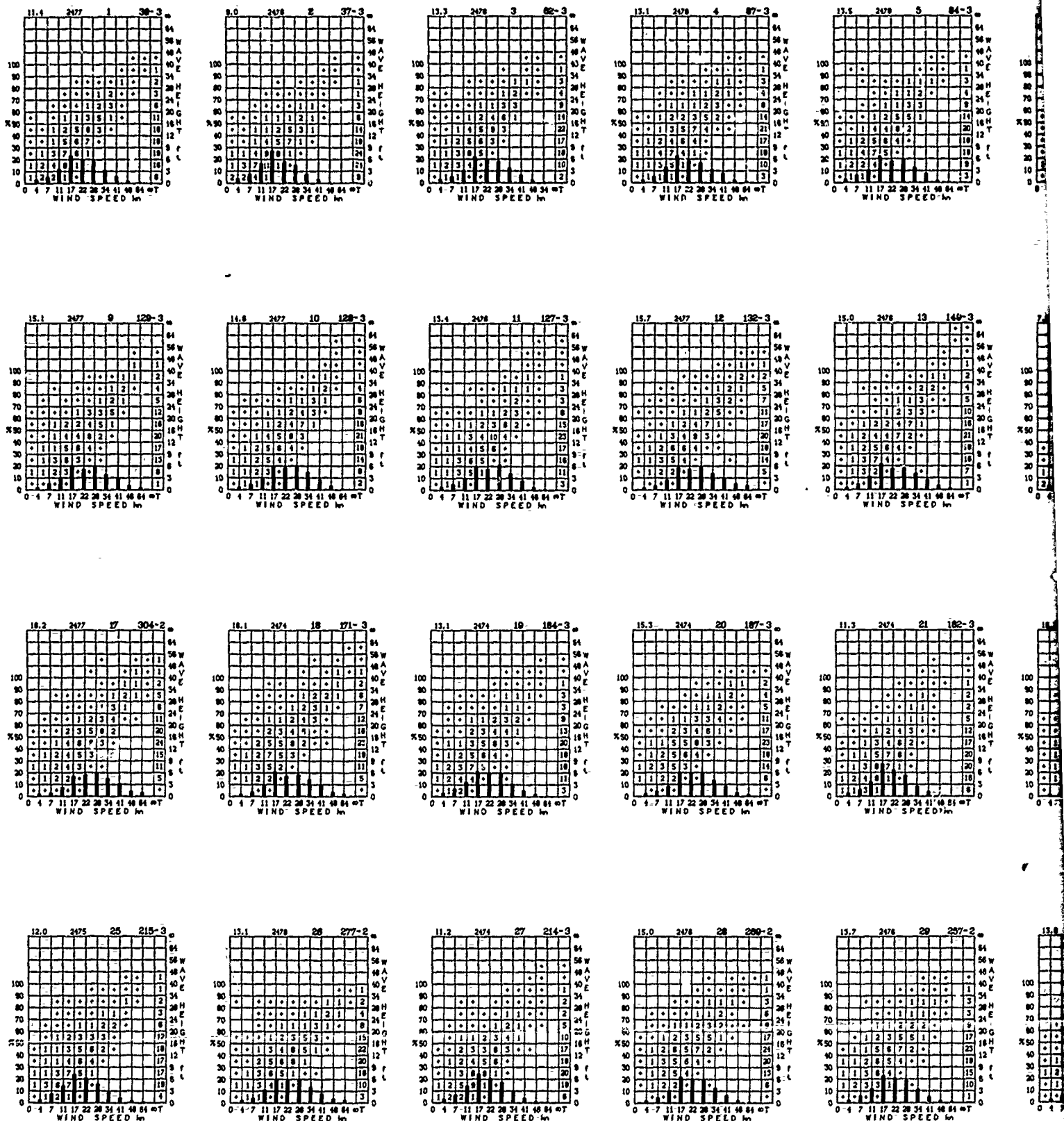


# FEBRUARY

(Cont'd)

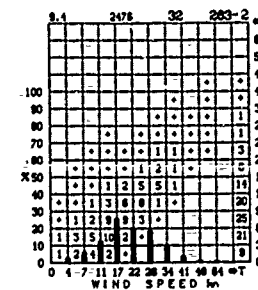
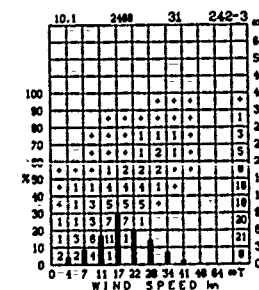
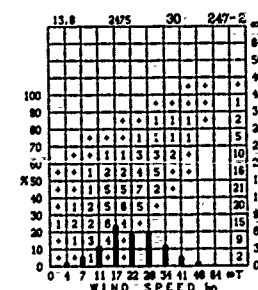
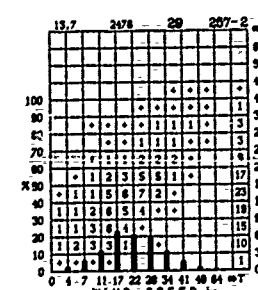
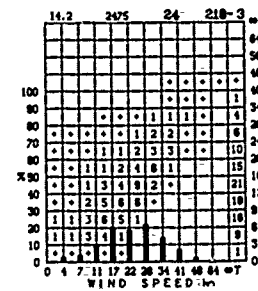
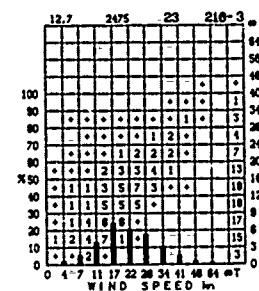
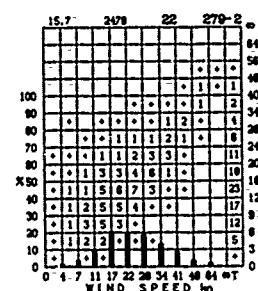
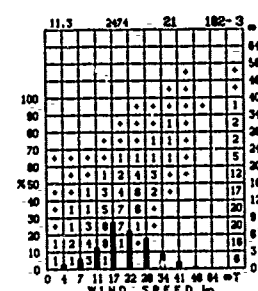
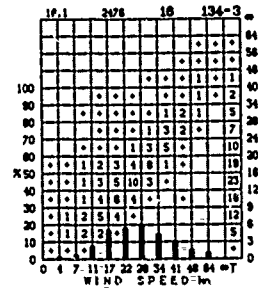
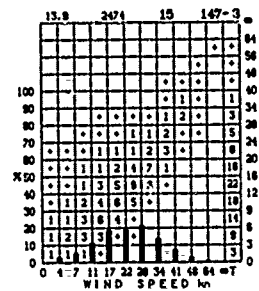
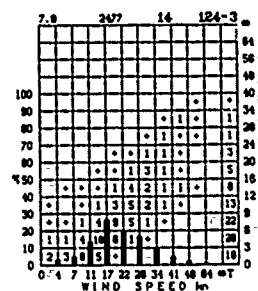
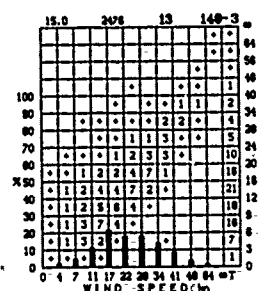
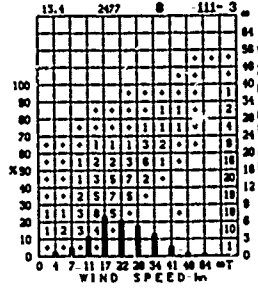
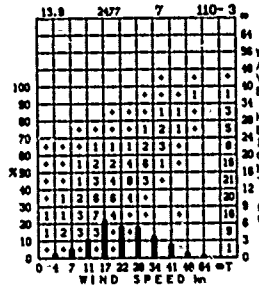
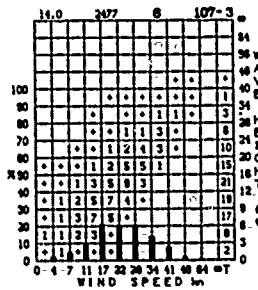
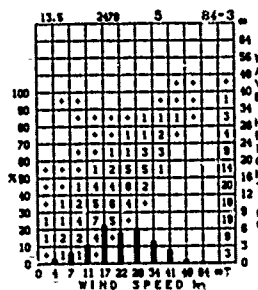


# MARCH



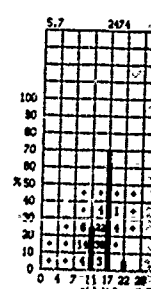
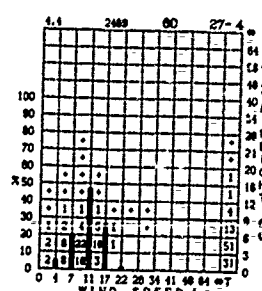
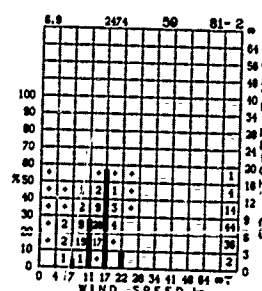
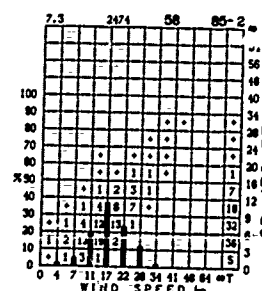
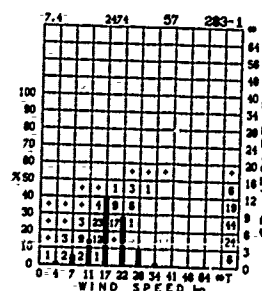
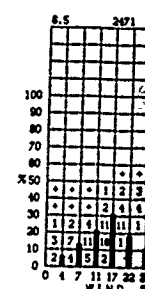
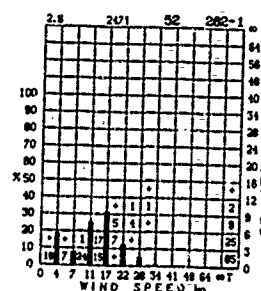
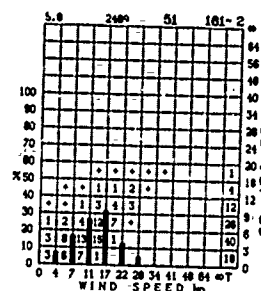
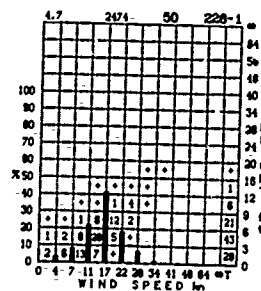
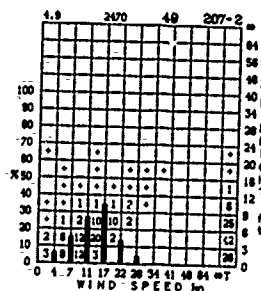
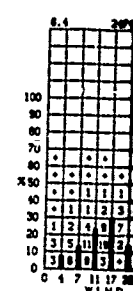
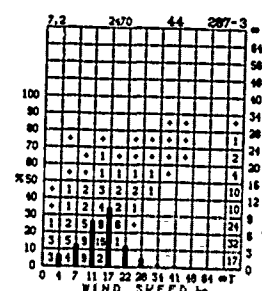
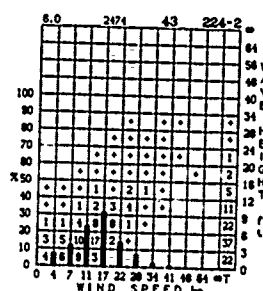
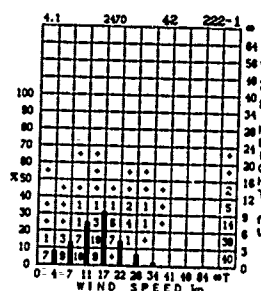
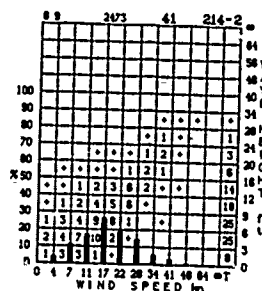
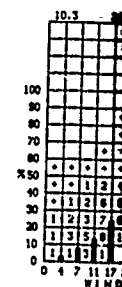
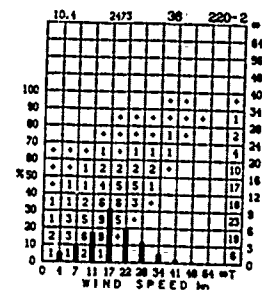
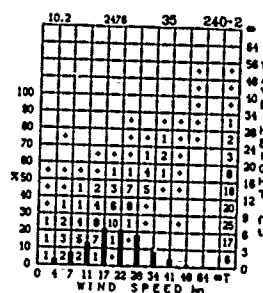
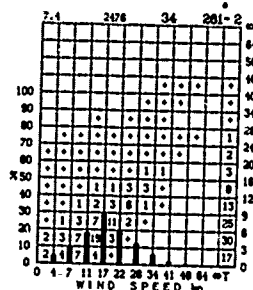
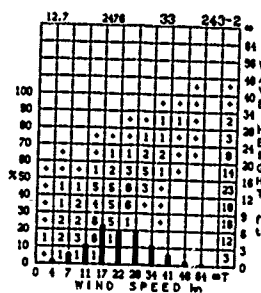


# WAVE HEIGHT AND WIND SPEED



2

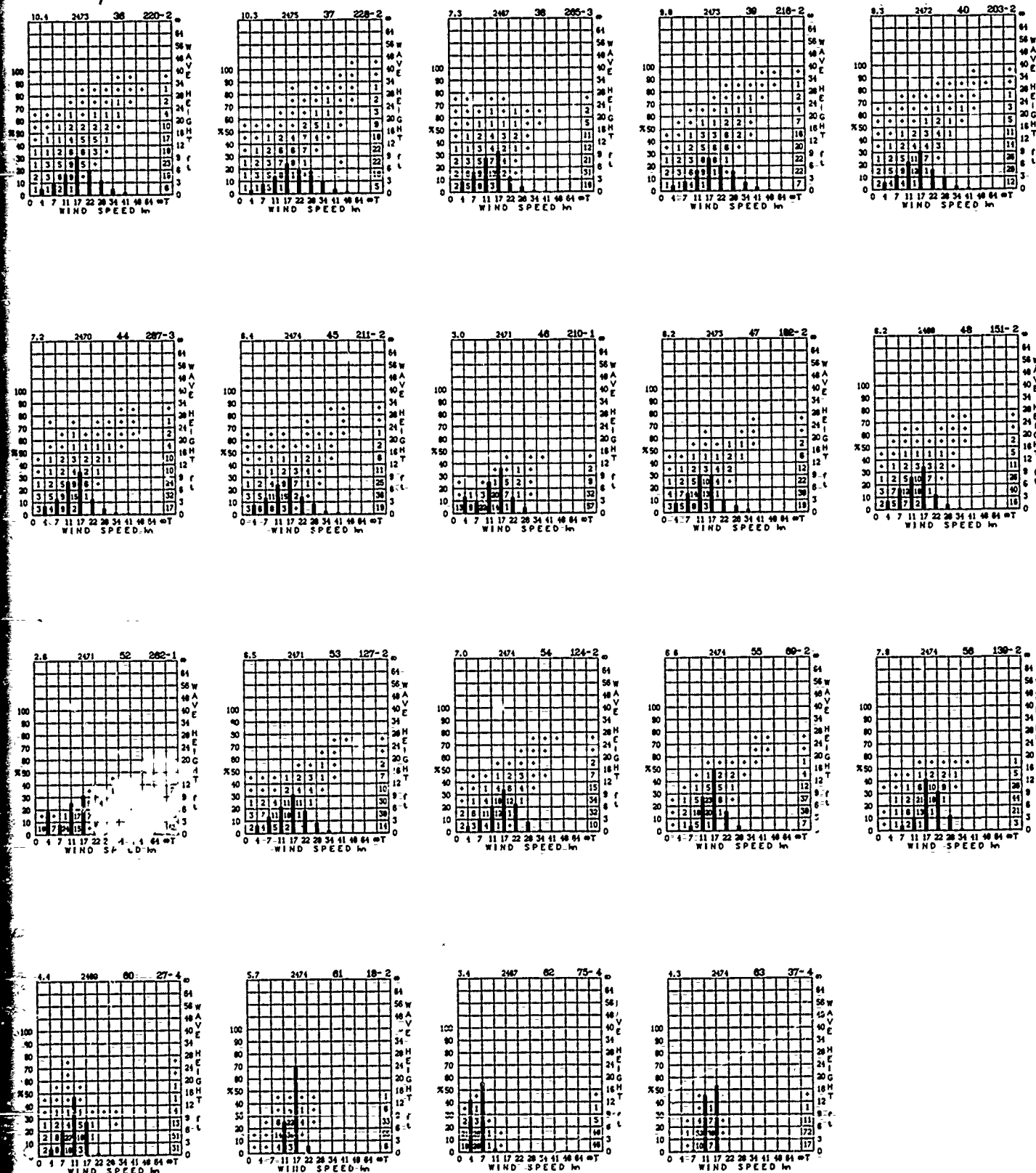
# WAVE HEIGHT AND WIND SPEED (Cont'd)



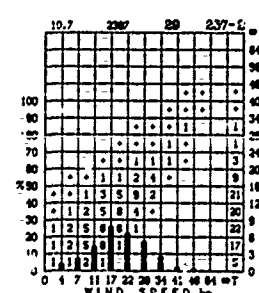
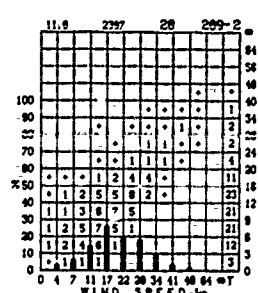
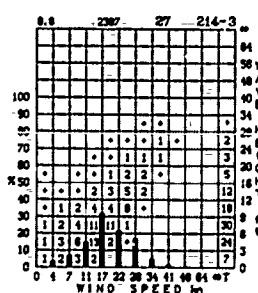
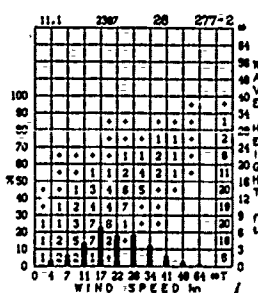
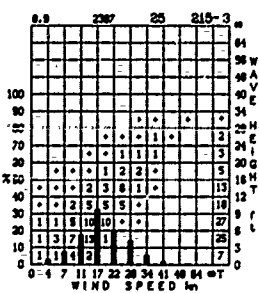
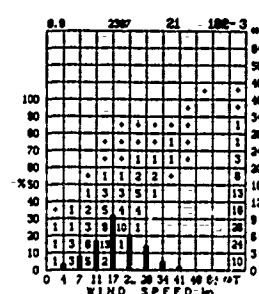
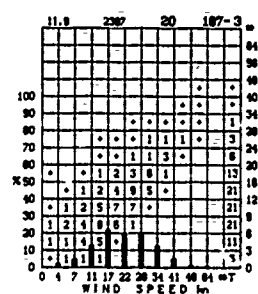
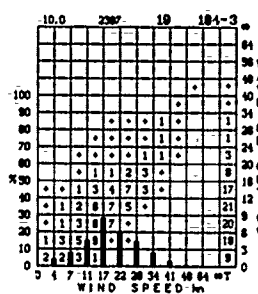
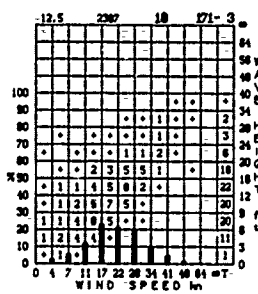
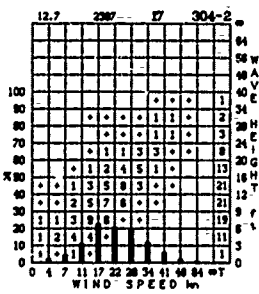
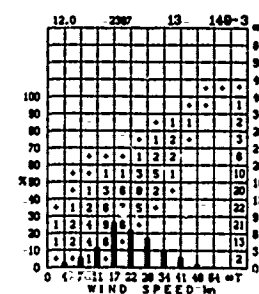
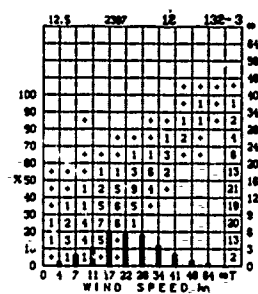
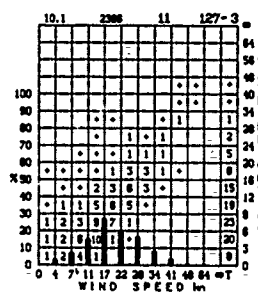
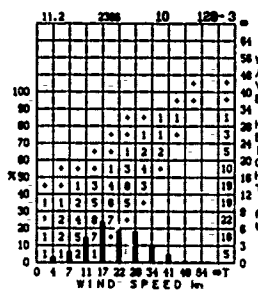
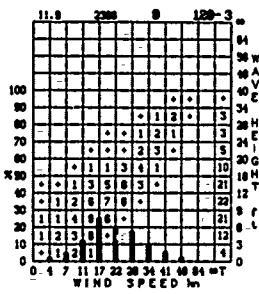
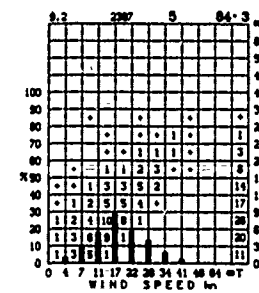
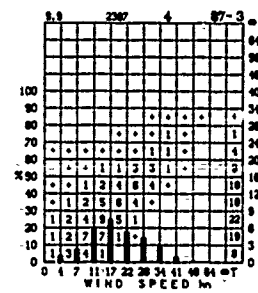
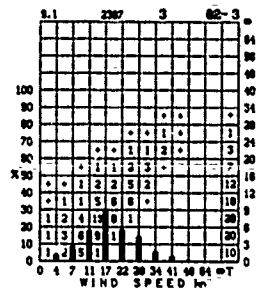
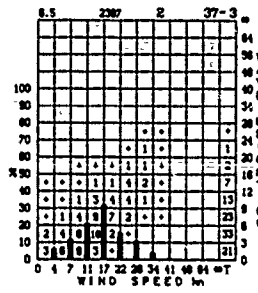
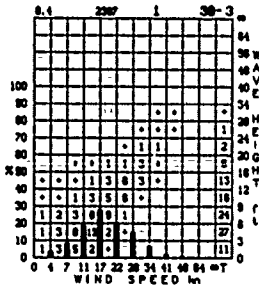
①

Cont'd)

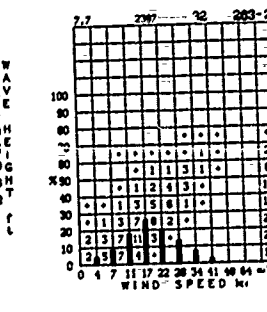
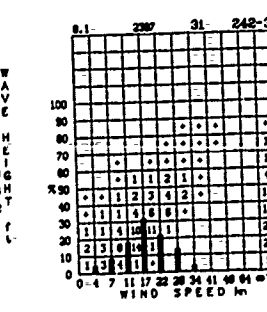
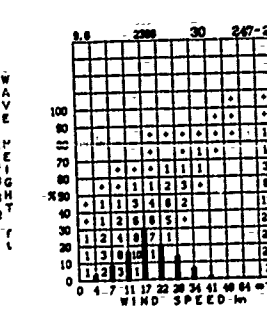
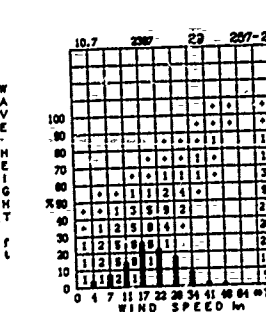
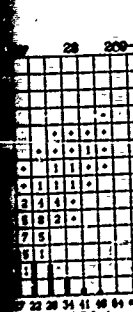
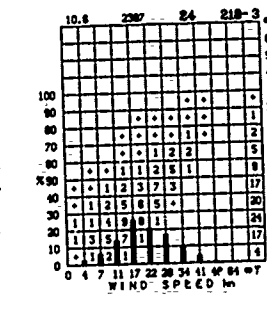
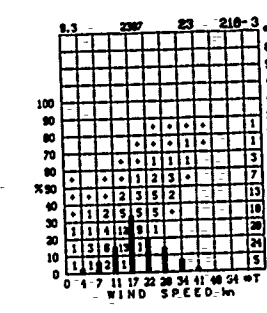
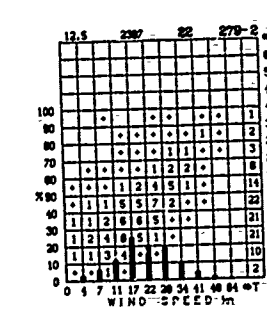
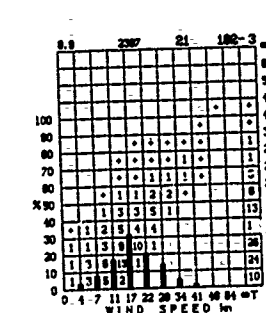
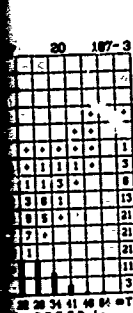
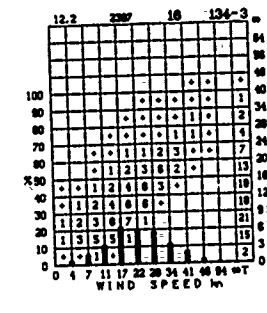
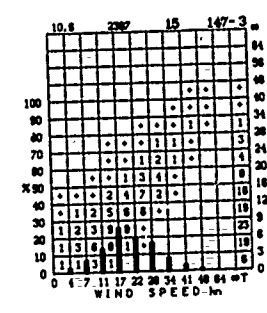
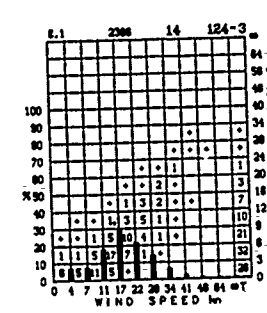
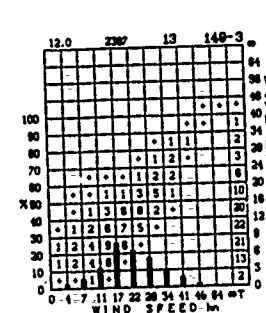
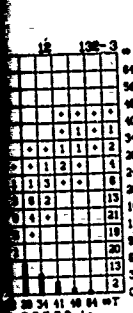
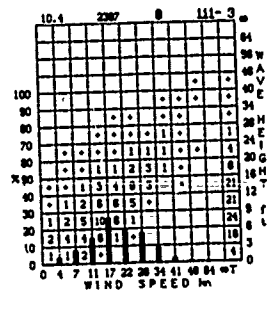
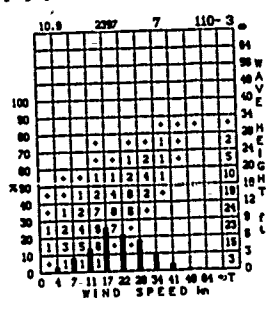
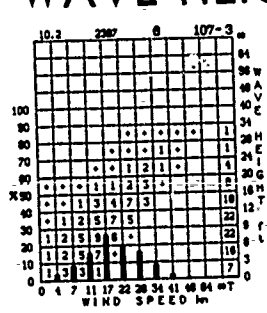
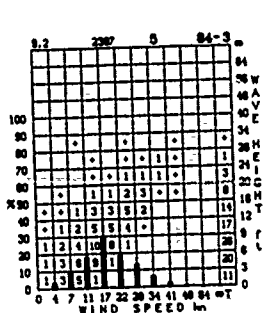
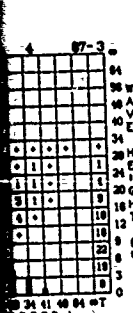
MARCH



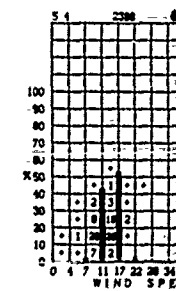
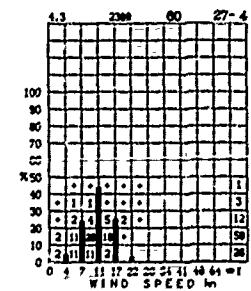
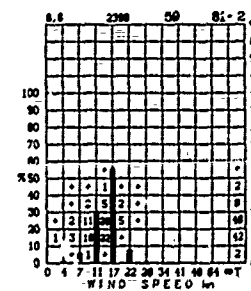
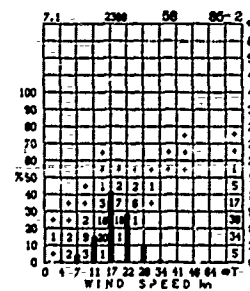
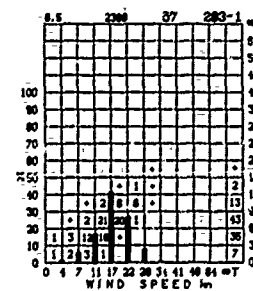
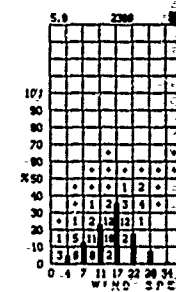
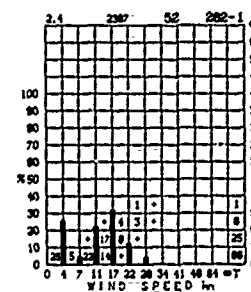
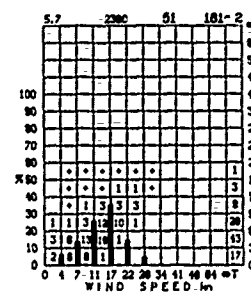
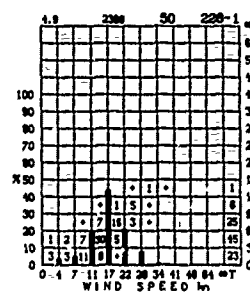
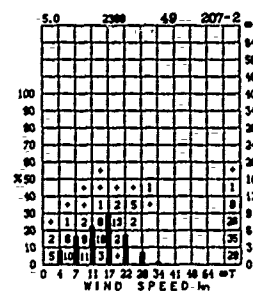
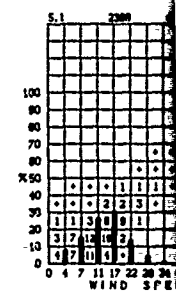
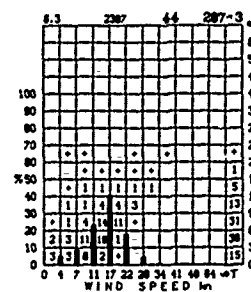
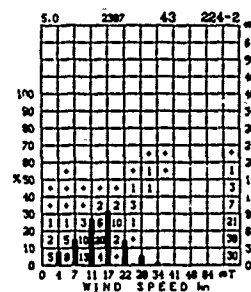
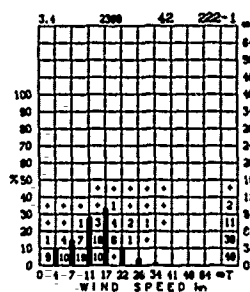
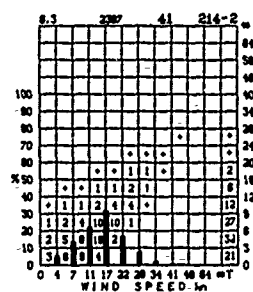
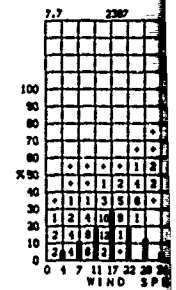
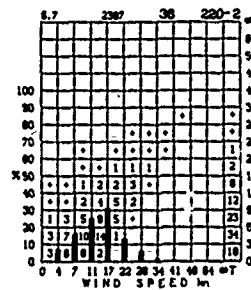
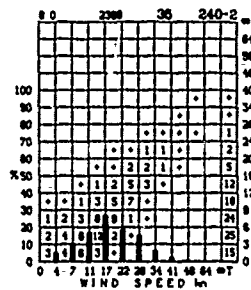
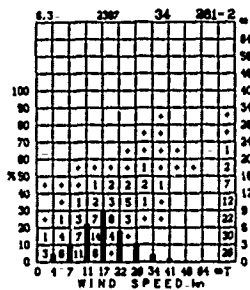
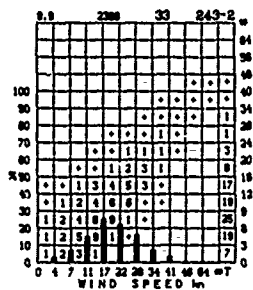
# APRIL



# WAVE HEIGHT AND WIND SPEED



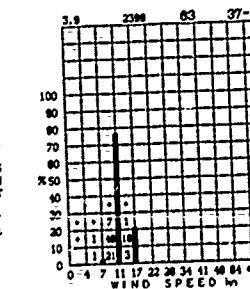
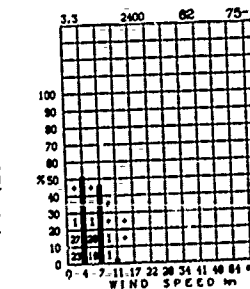
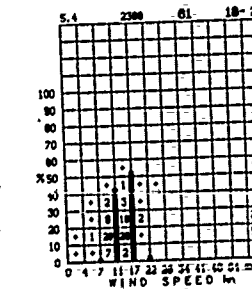
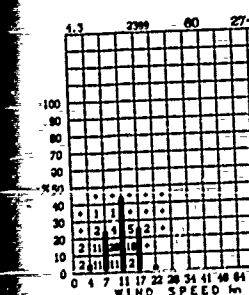
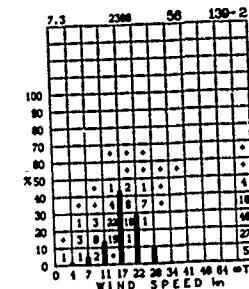
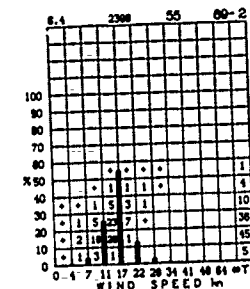
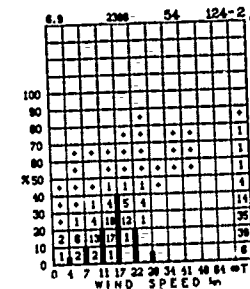
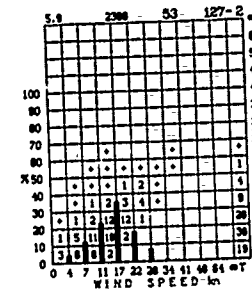
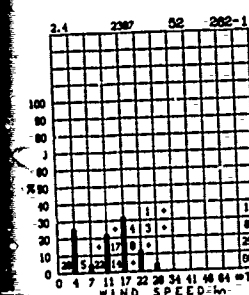
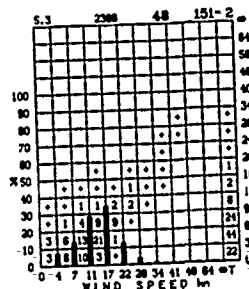
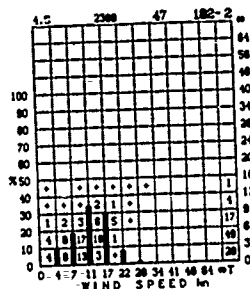
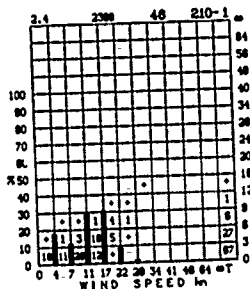
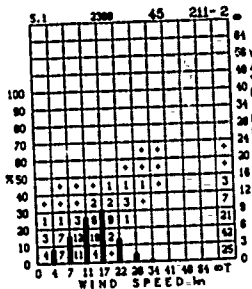
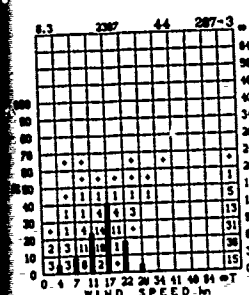
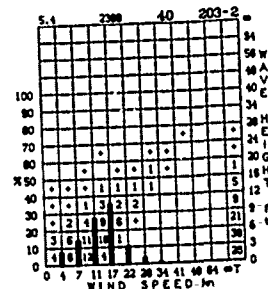
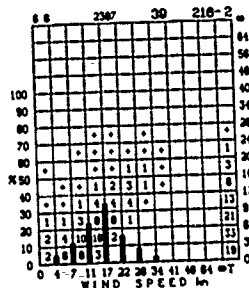
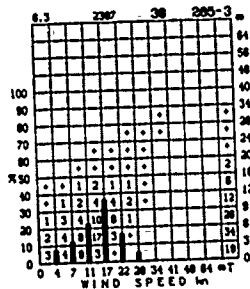
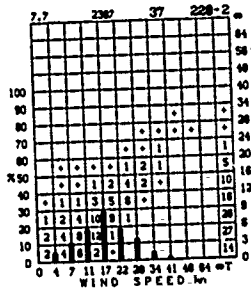
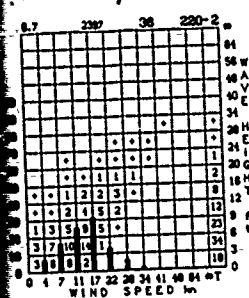
# WAVE HEIGHT AND WIND SPEED (Cont'd)



①

ont'd)

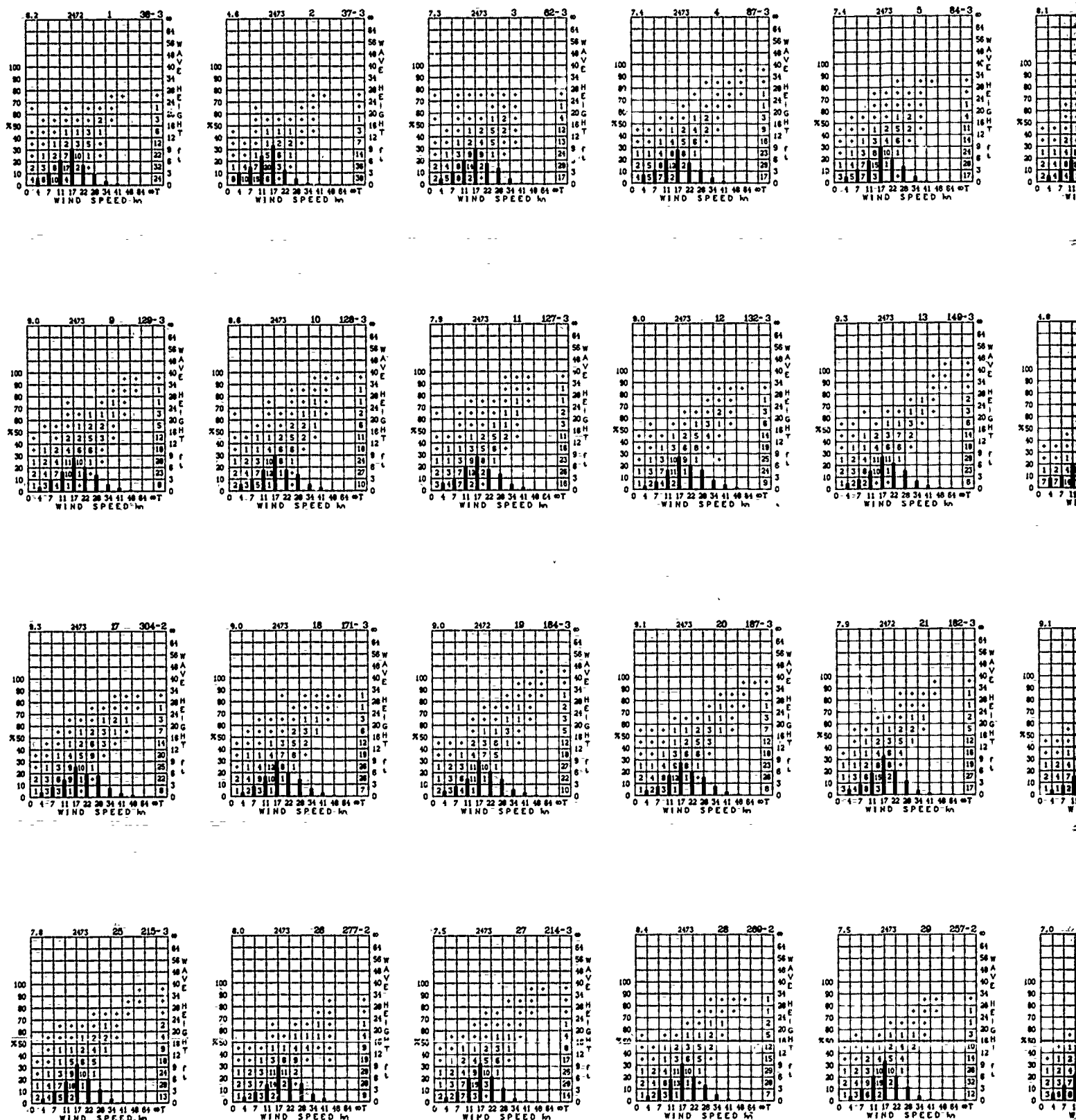
APRIL





# MAY

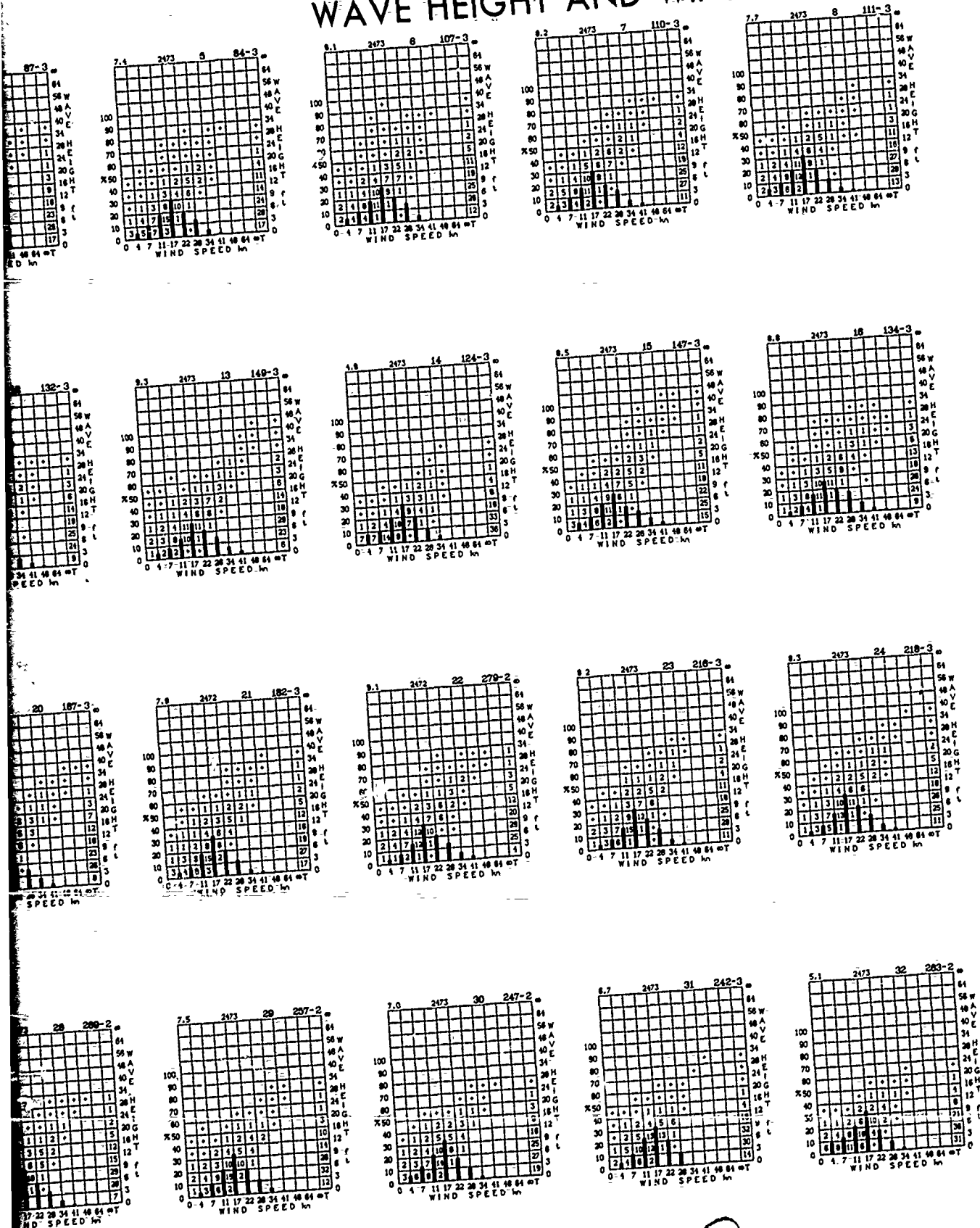
# WA



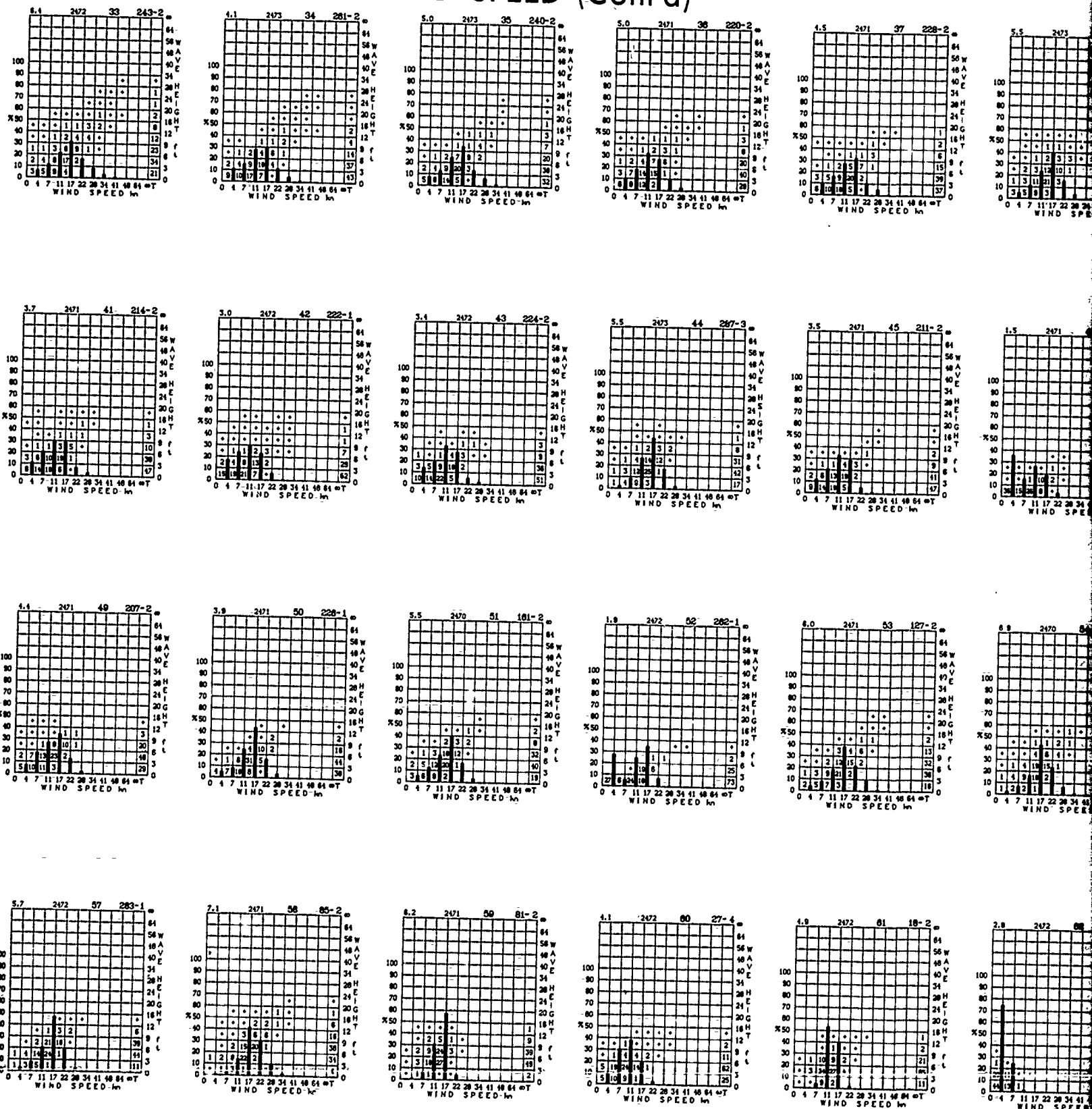
①



# WAVE HEIGHT AND WIND SPEED

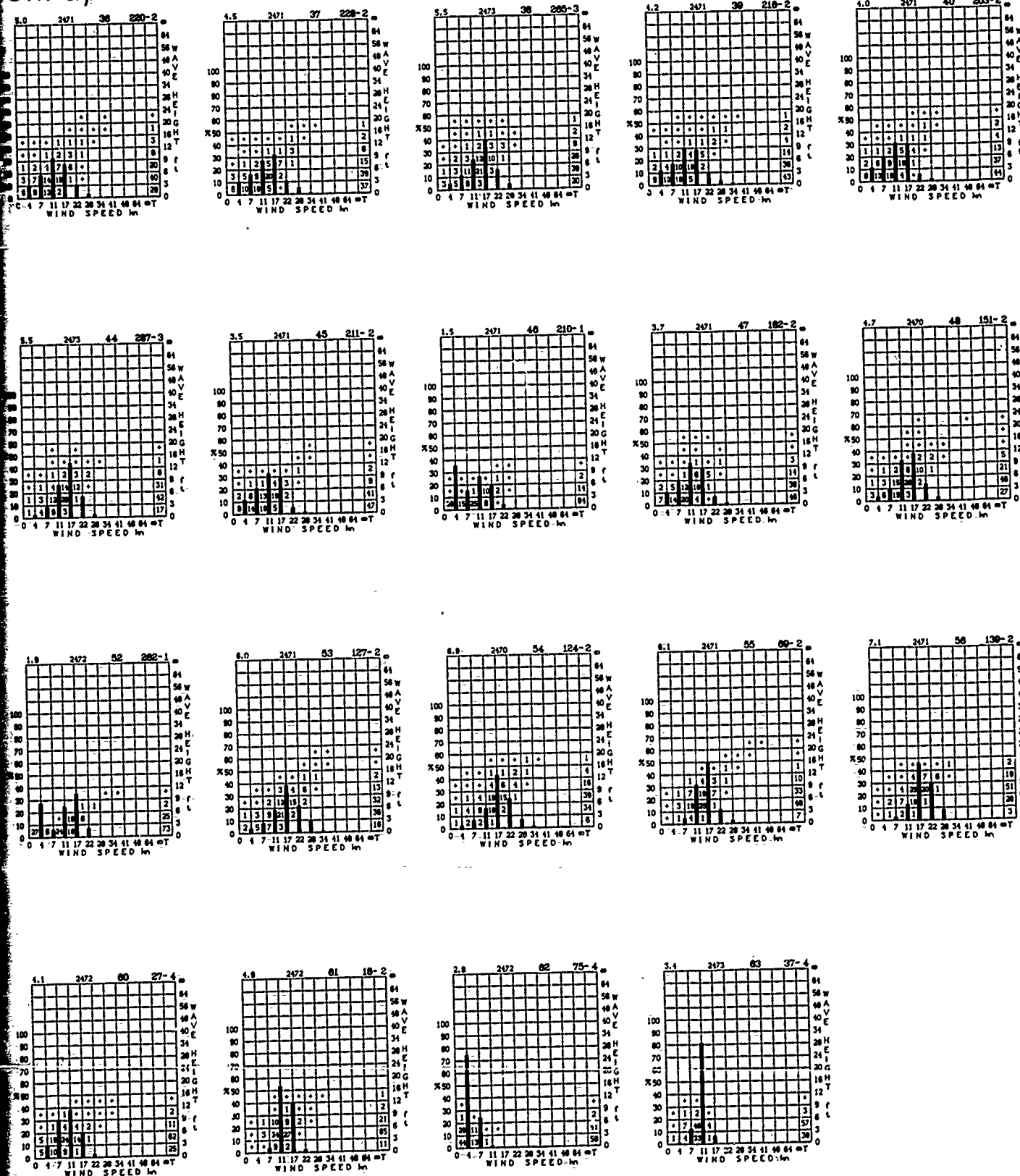


# WAVE HEIGHT AND WIND SPEED (Cont'd)



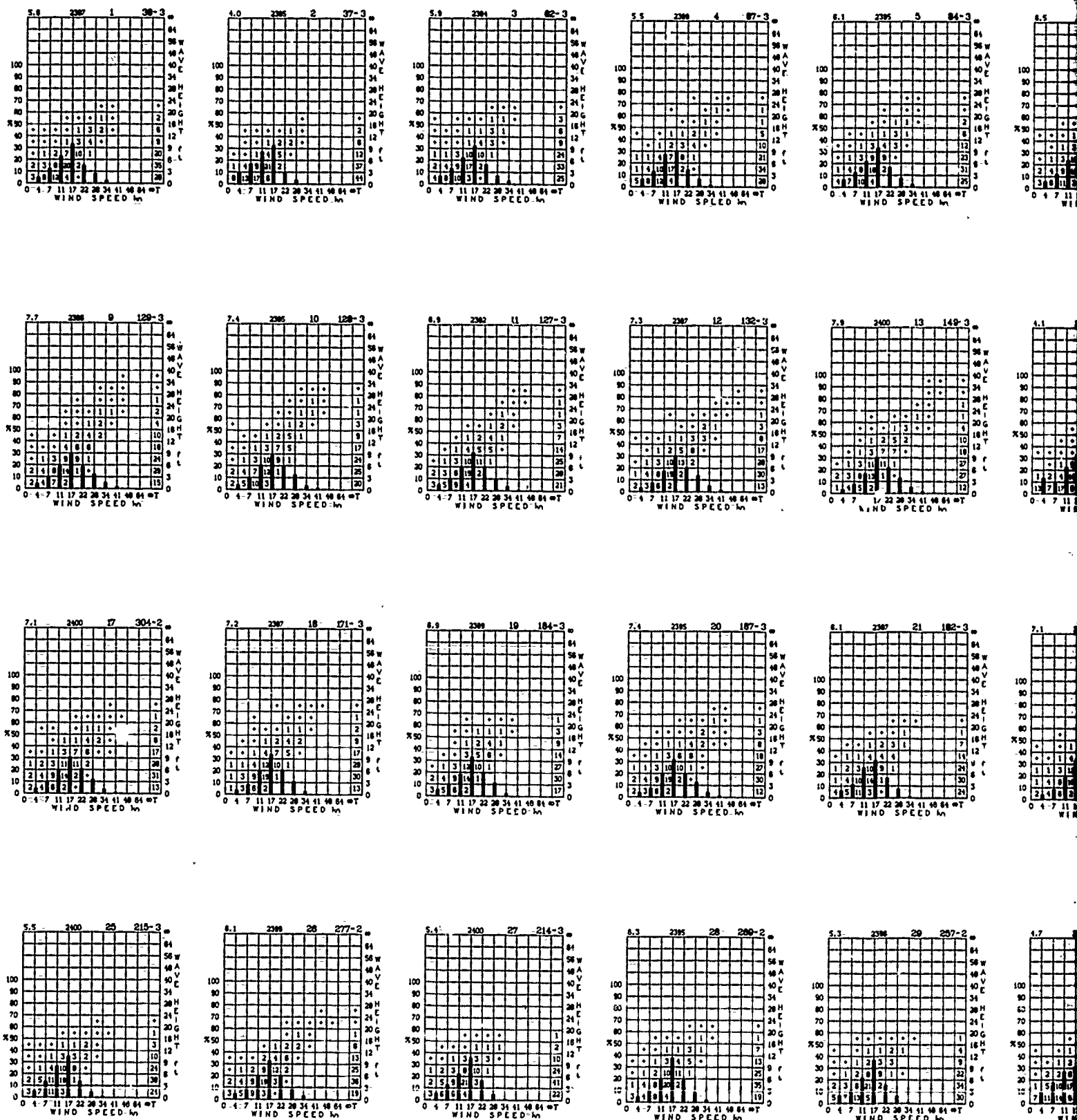
ont'd)

MAY

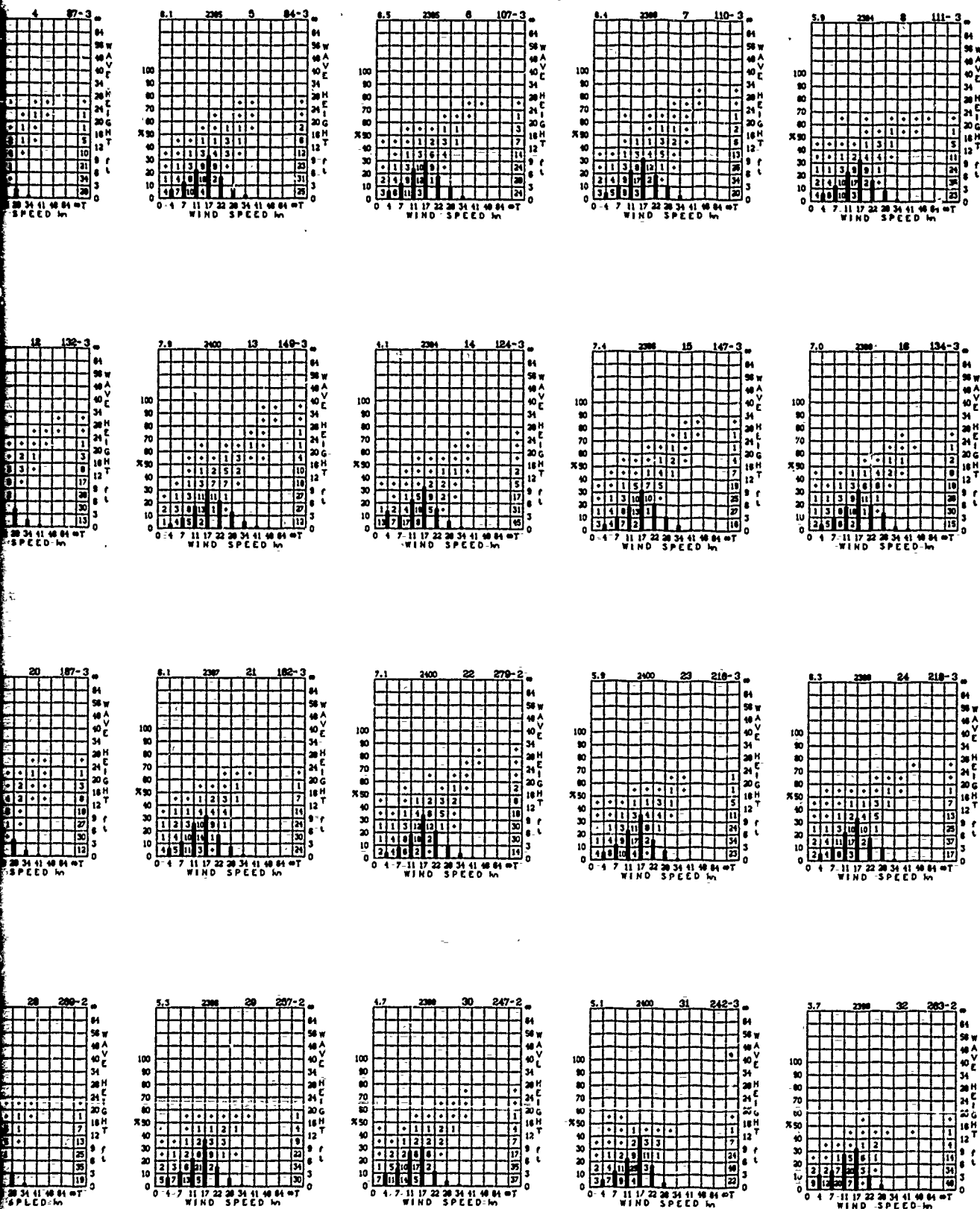


# JUNE

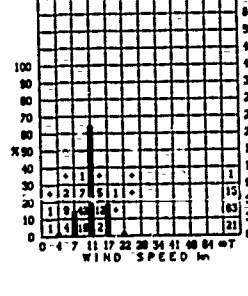
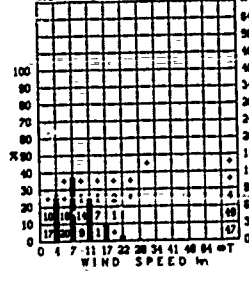
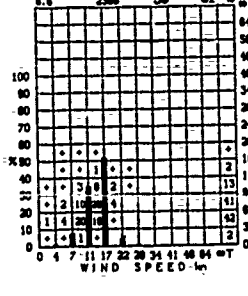
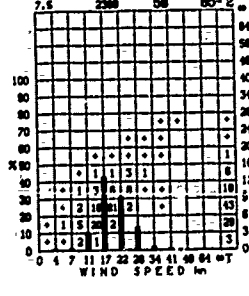
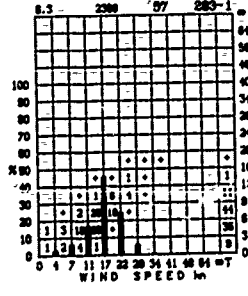
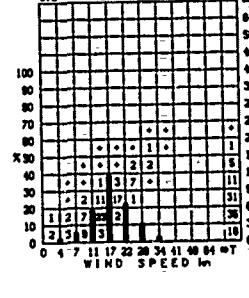
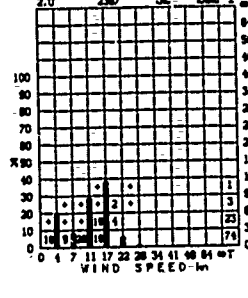
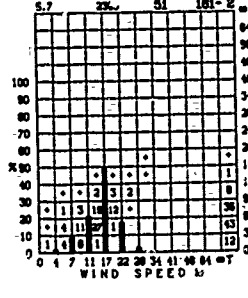
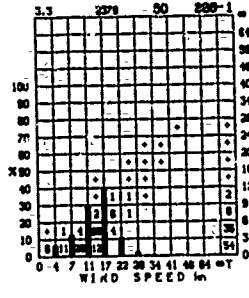
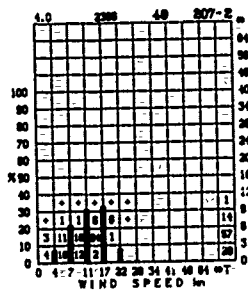
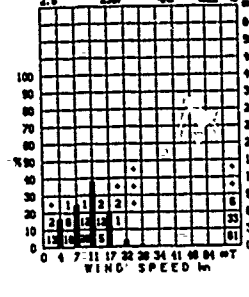
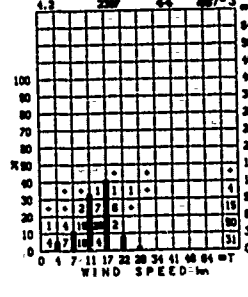
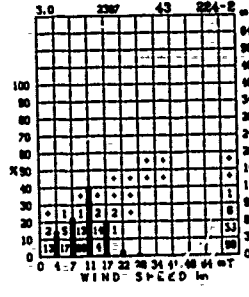
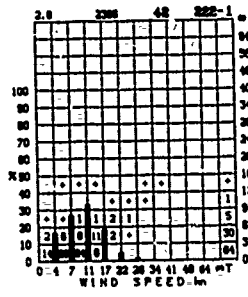
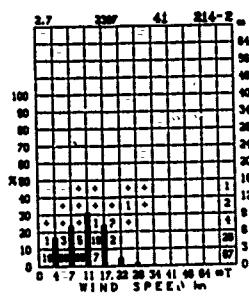
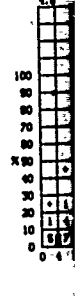
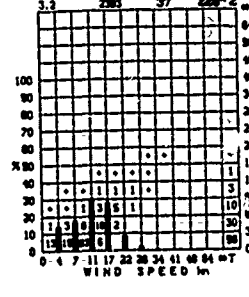
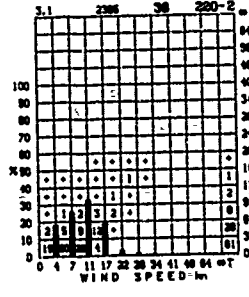
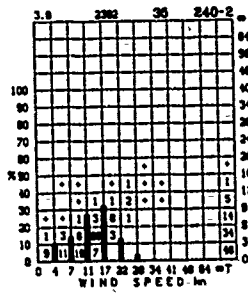
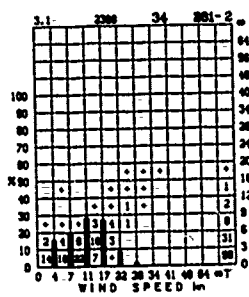
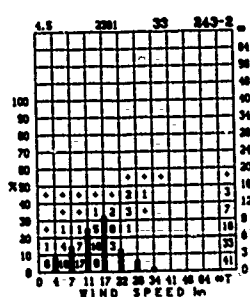
# WA



# WAVE HEIGHT AND WIND SPEED

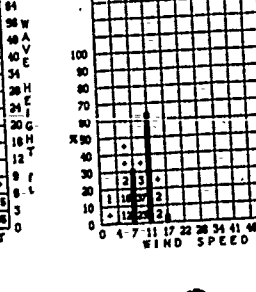
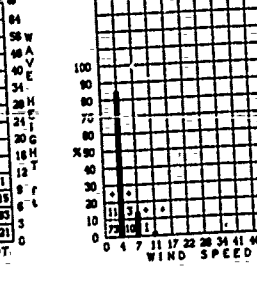
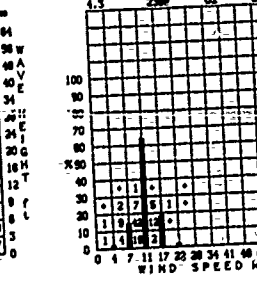
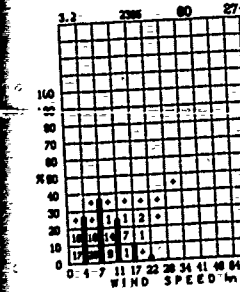
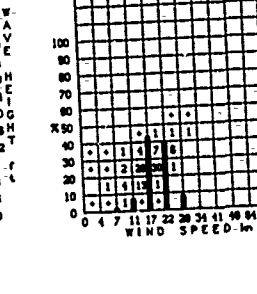
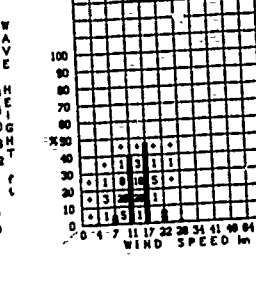
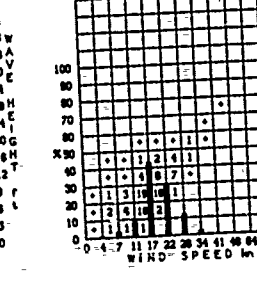
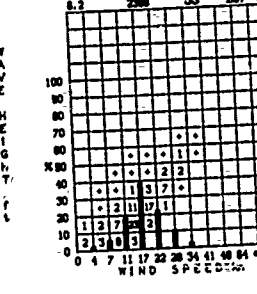
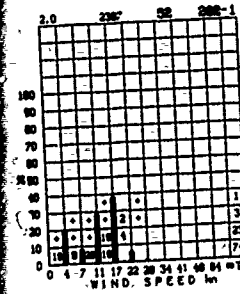
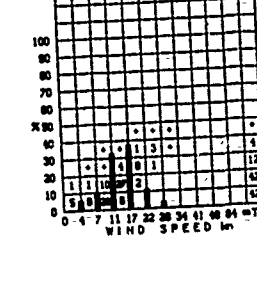
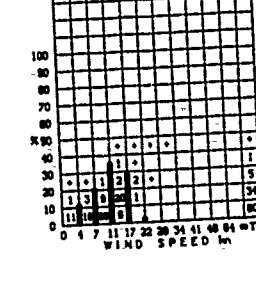
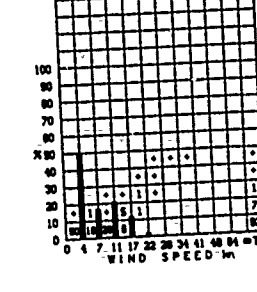
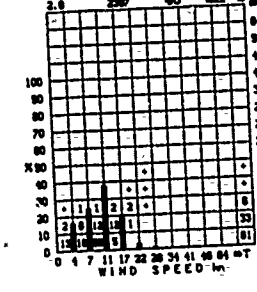
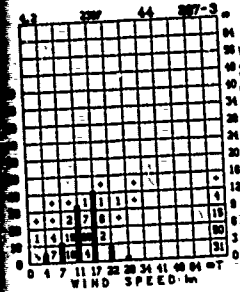
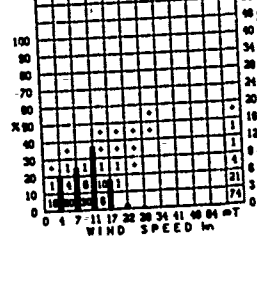
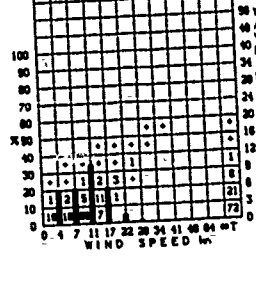
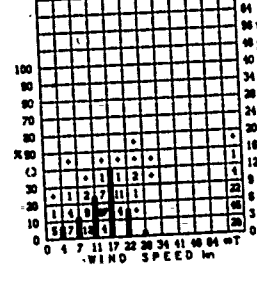
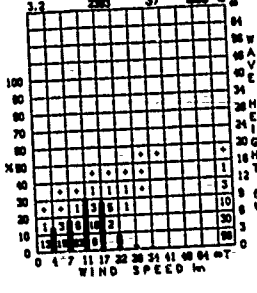
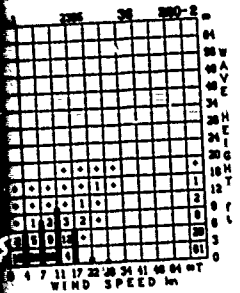


# WAVE HEIGHT AND WIND SPEED (Cont'd)



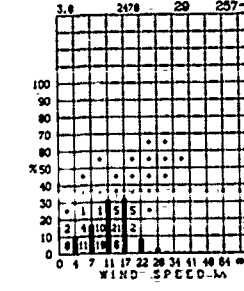
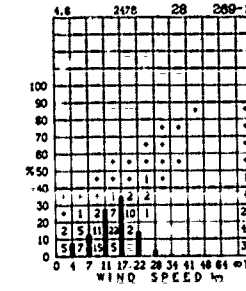
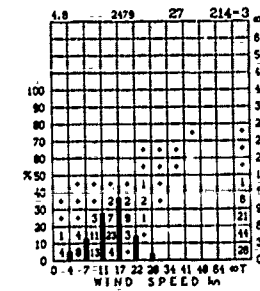
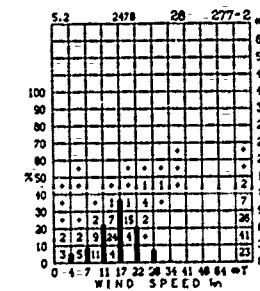
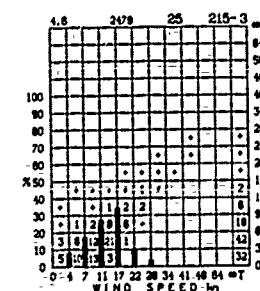
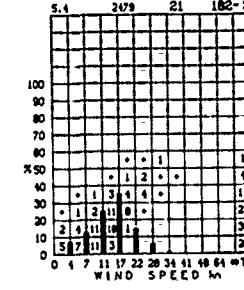
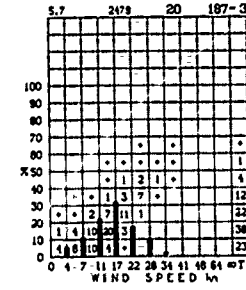
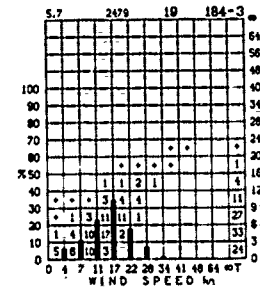
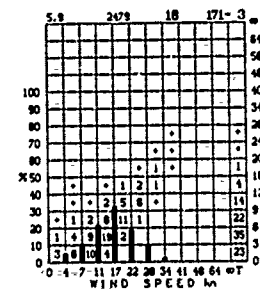
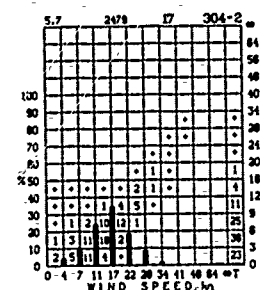
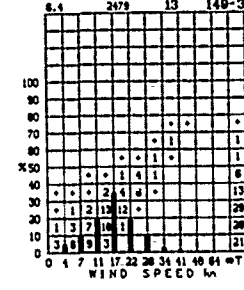
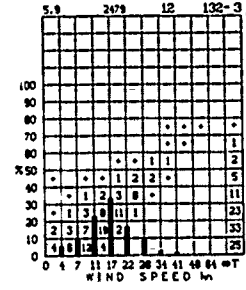
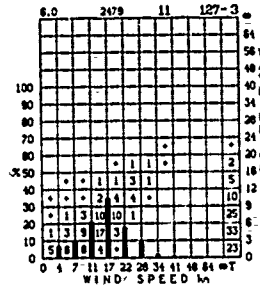
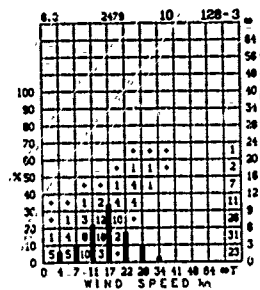
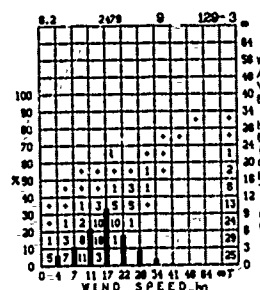
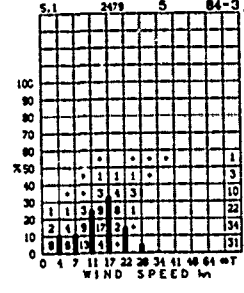
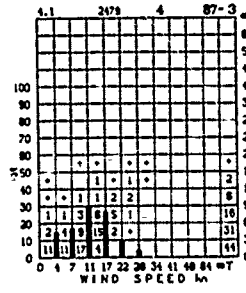
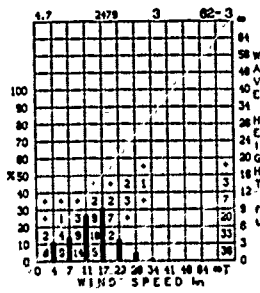
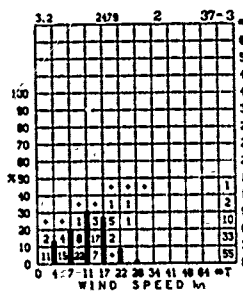
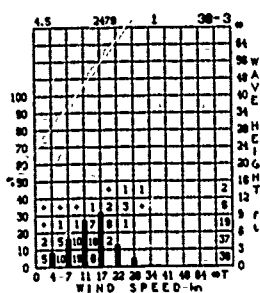
# JUNE

ont'd)



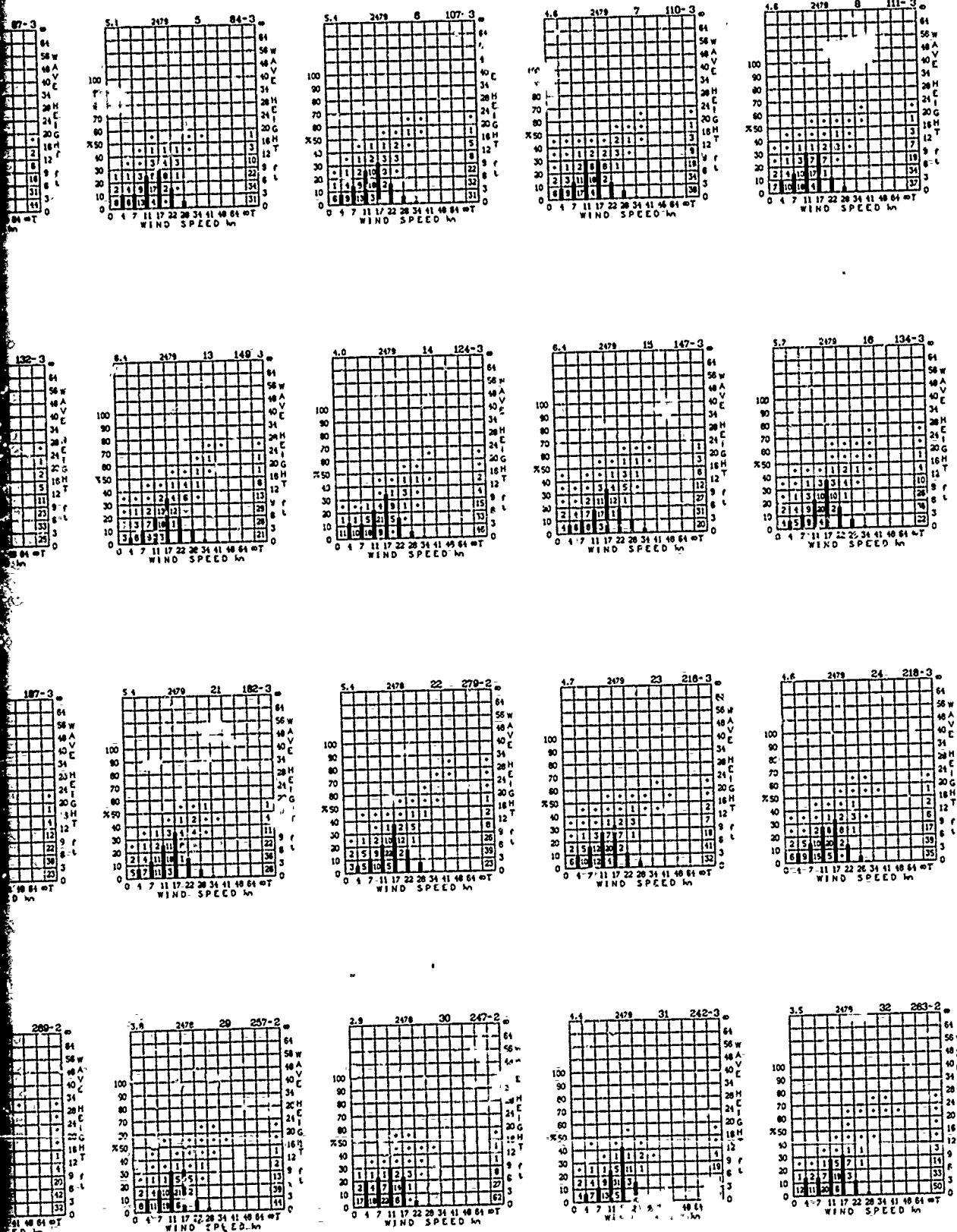


# JULY

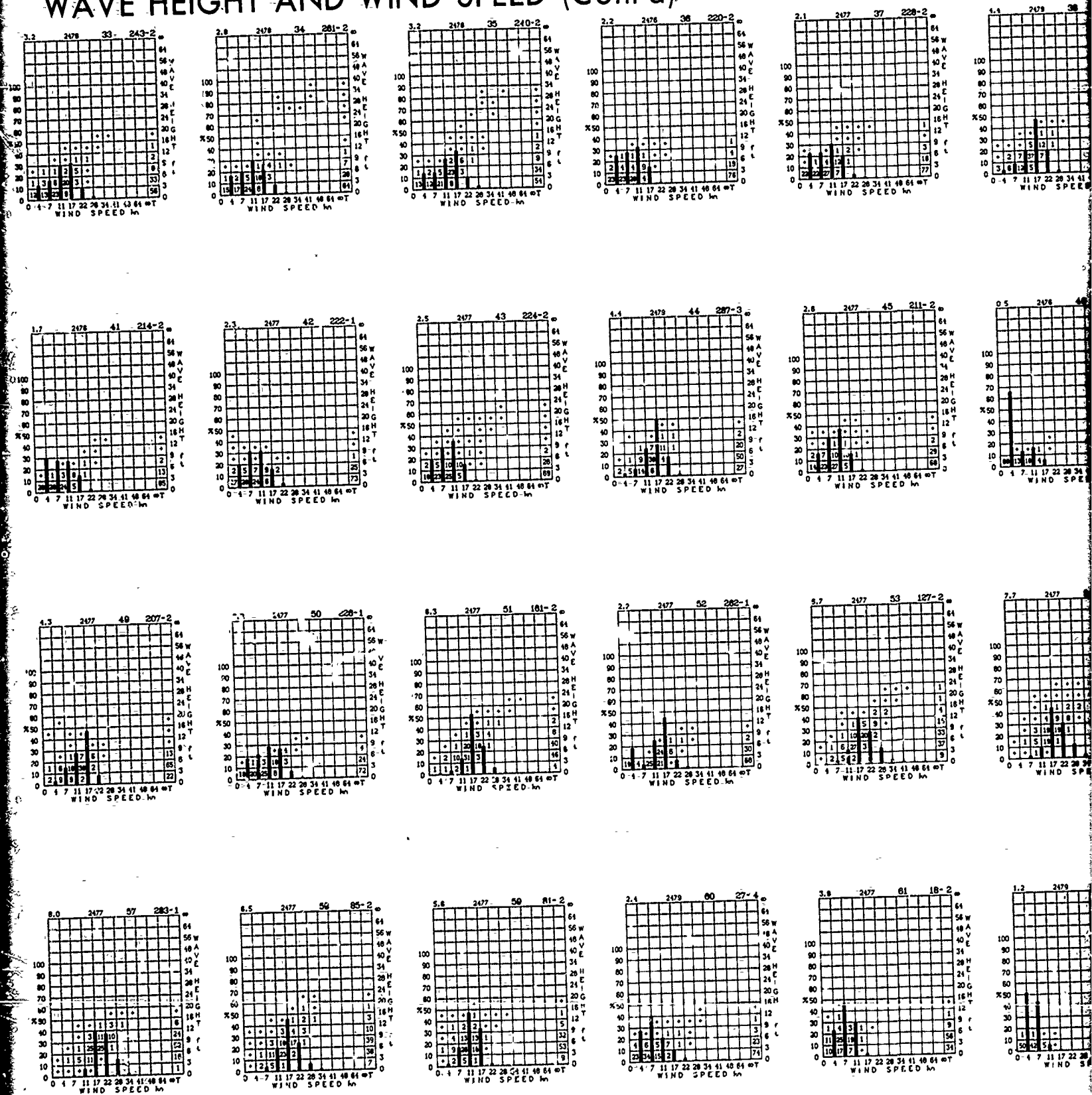




# WAVE HEIGHT AND WIND SPEED

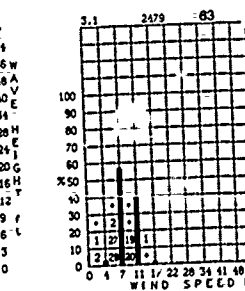
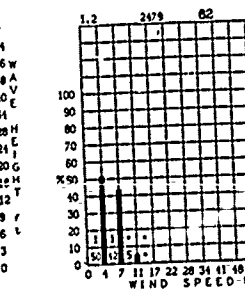
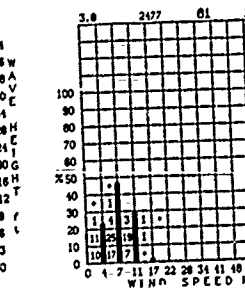
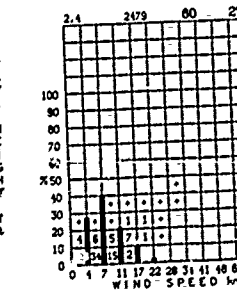
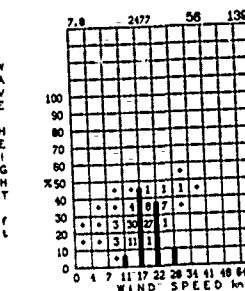
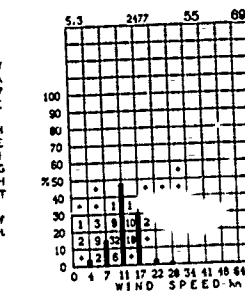
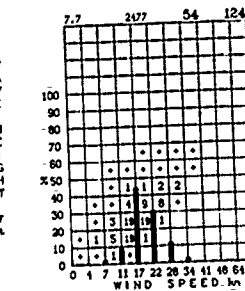
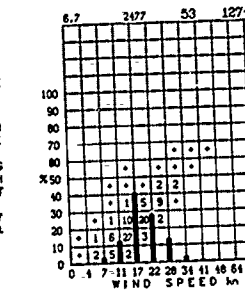
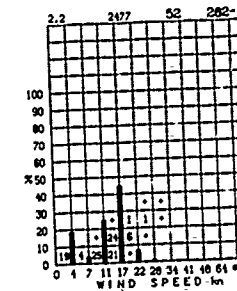
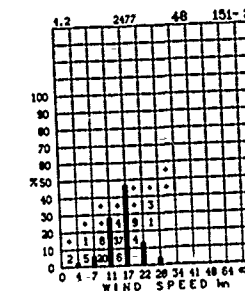
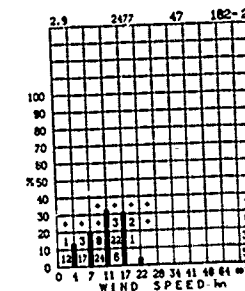
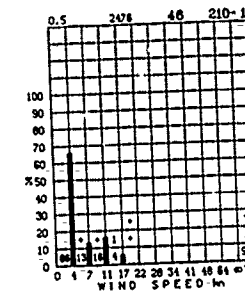
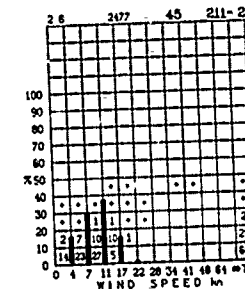
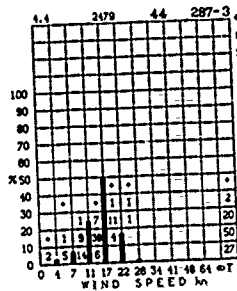
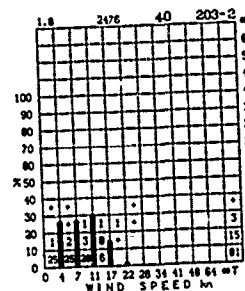
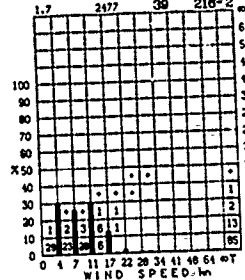
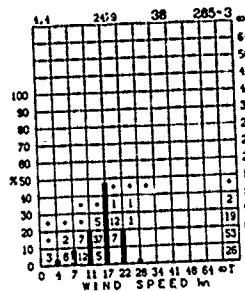
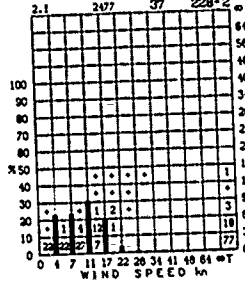
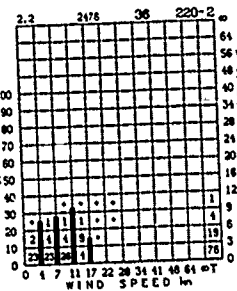


# WAVE HEIGHT AND WIND SPEED (Cont'd)



JULY

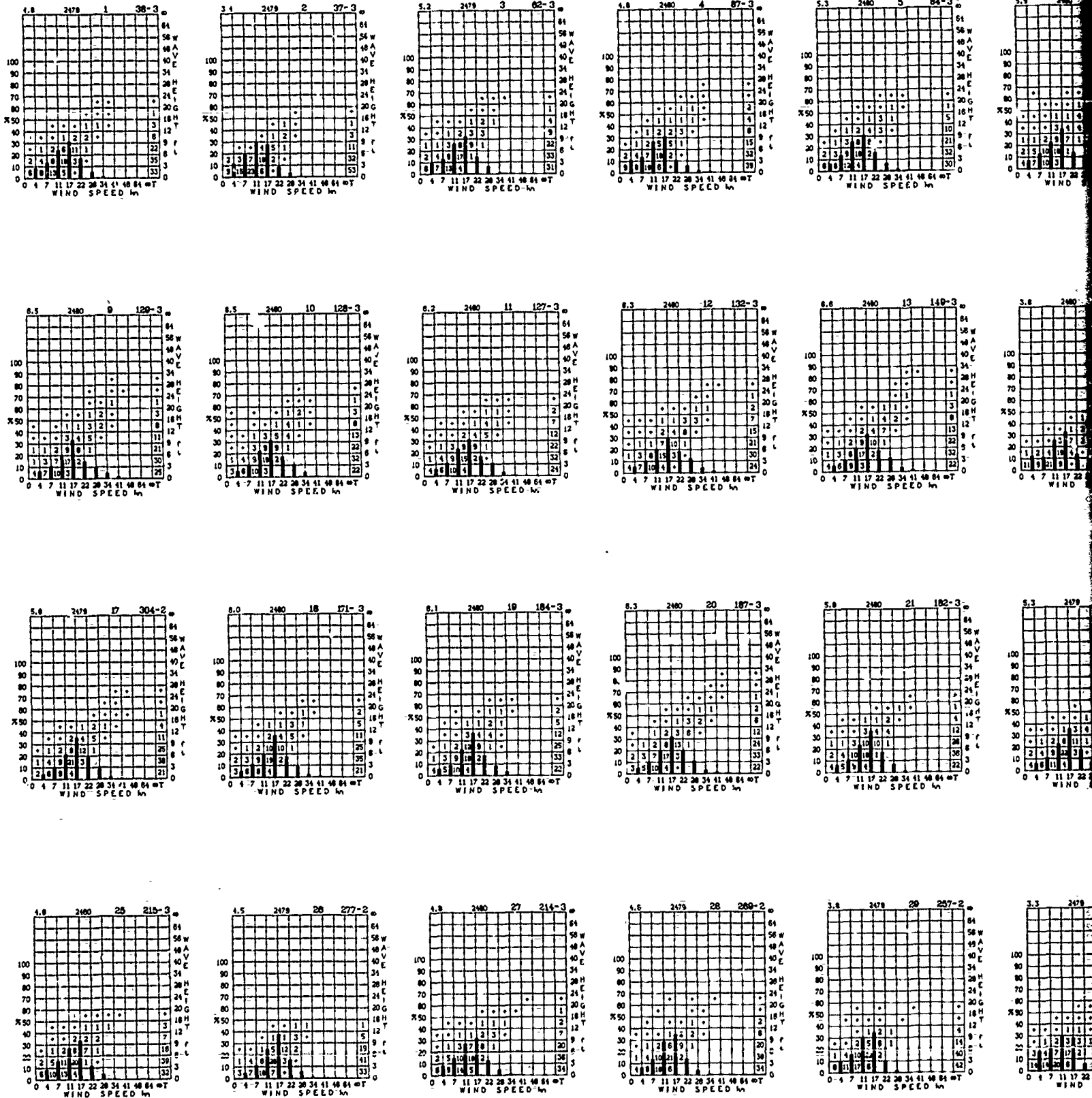
(Cont'd)



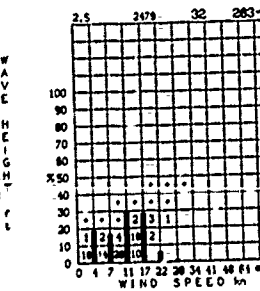
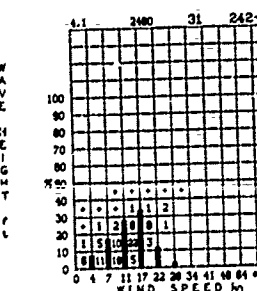
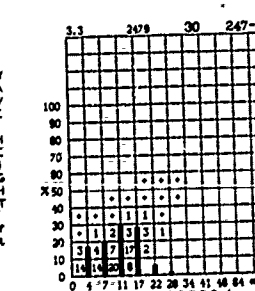
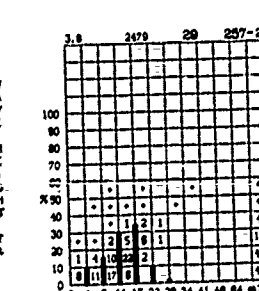
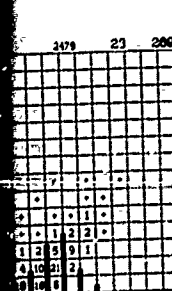
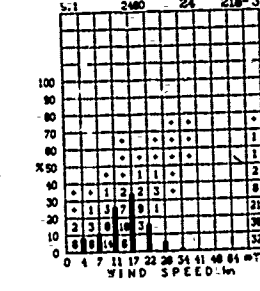
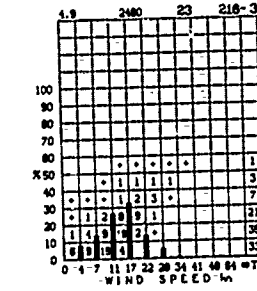
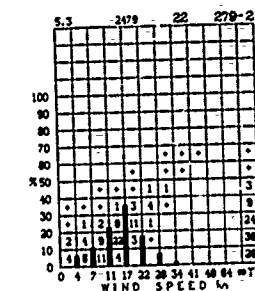
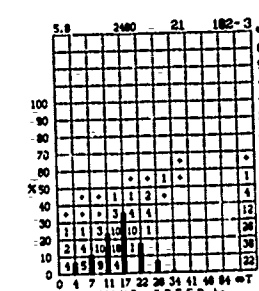
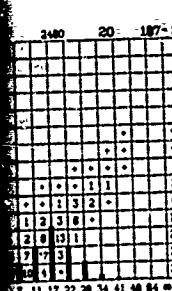
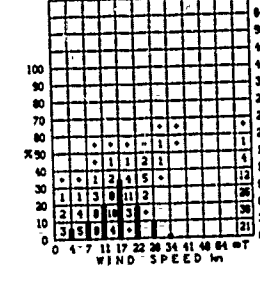
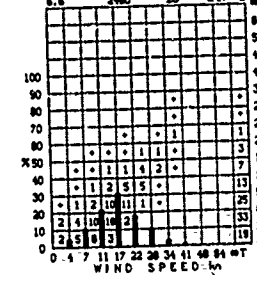
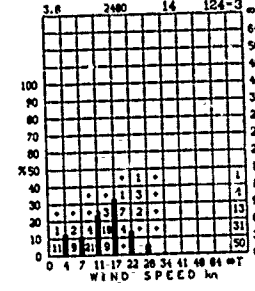
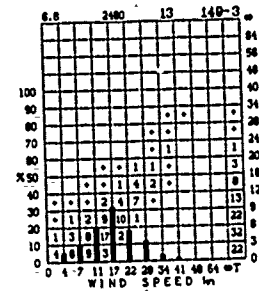
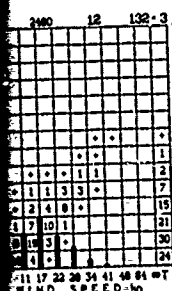
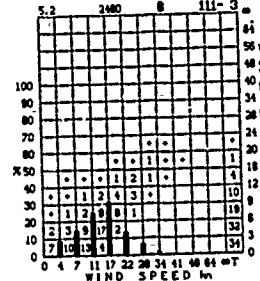
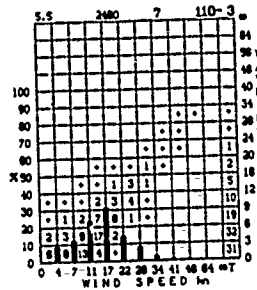
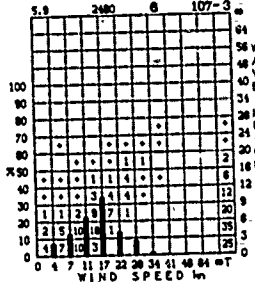
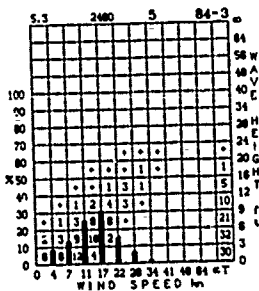
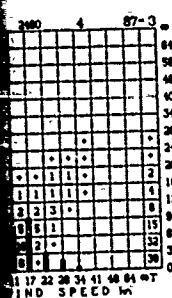
2

# AUGUST

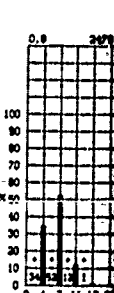
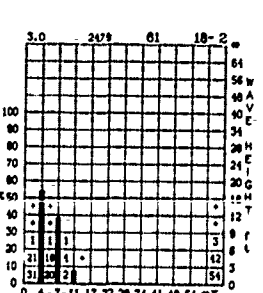
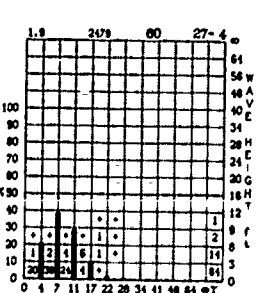
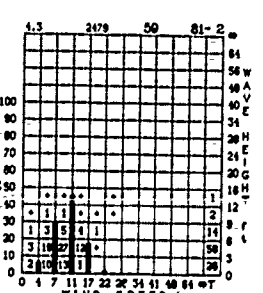
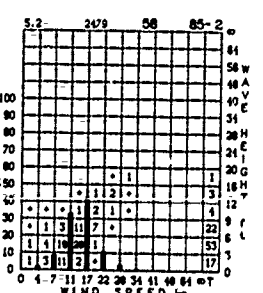
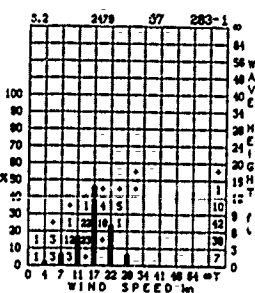
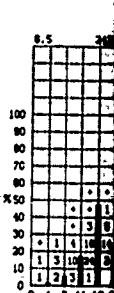
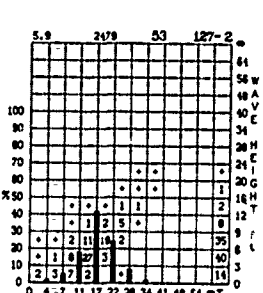
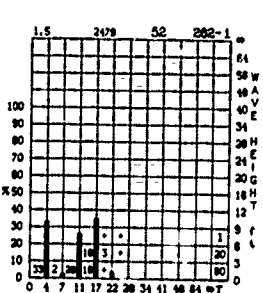
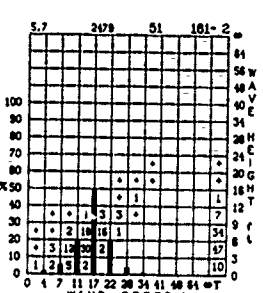
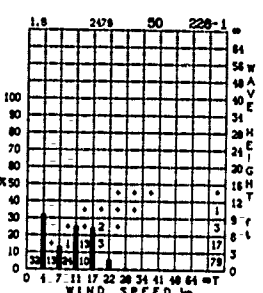
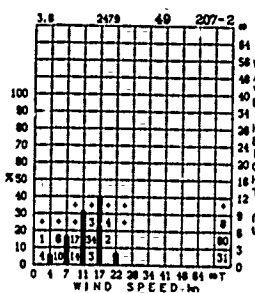
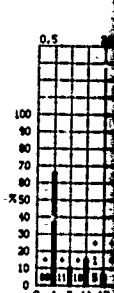
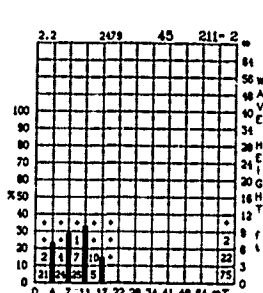
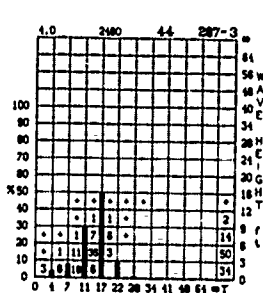
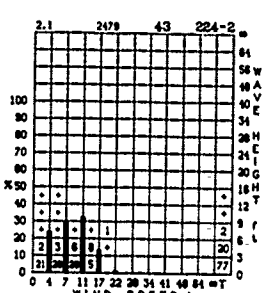
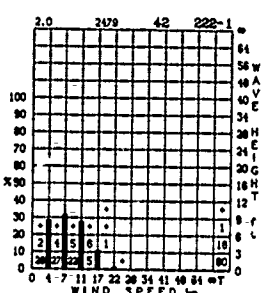
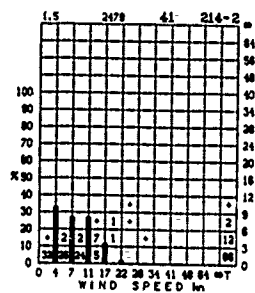
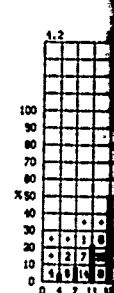
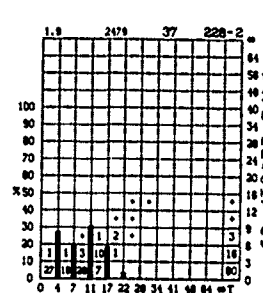
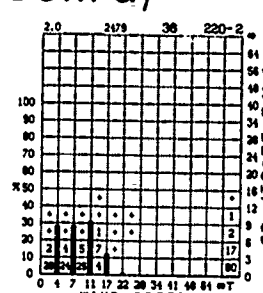
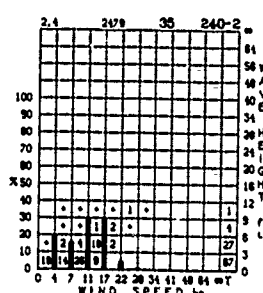
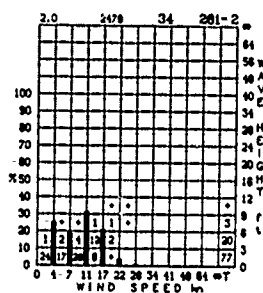
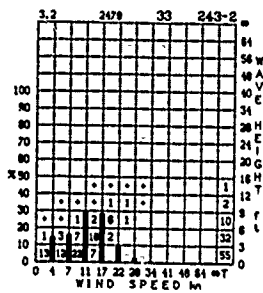
# WAV



# WAVE HEIGHT AND WIND SPEED



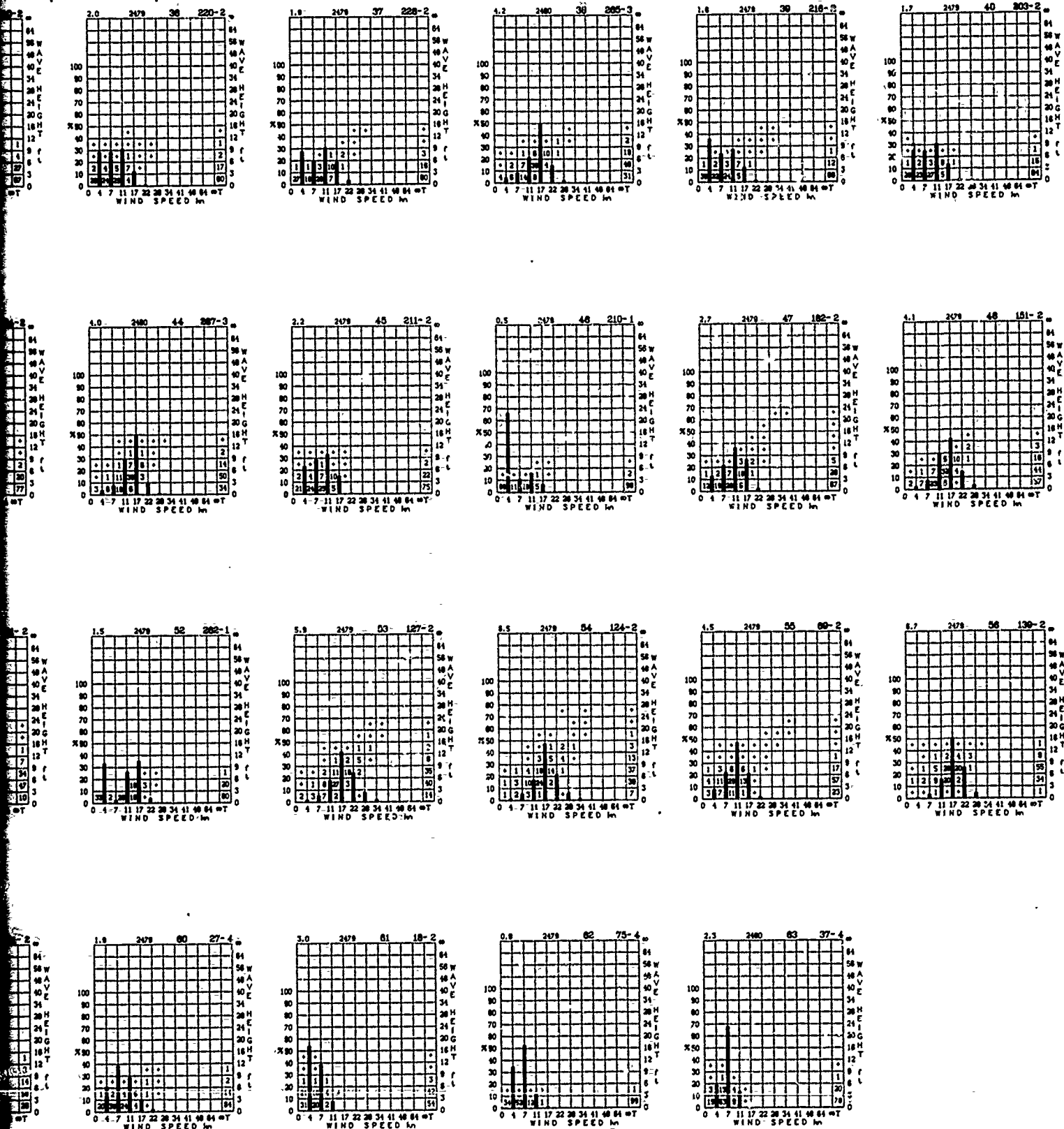
## WAVE HEIGHT AND WIND SPEED (Cont'd)





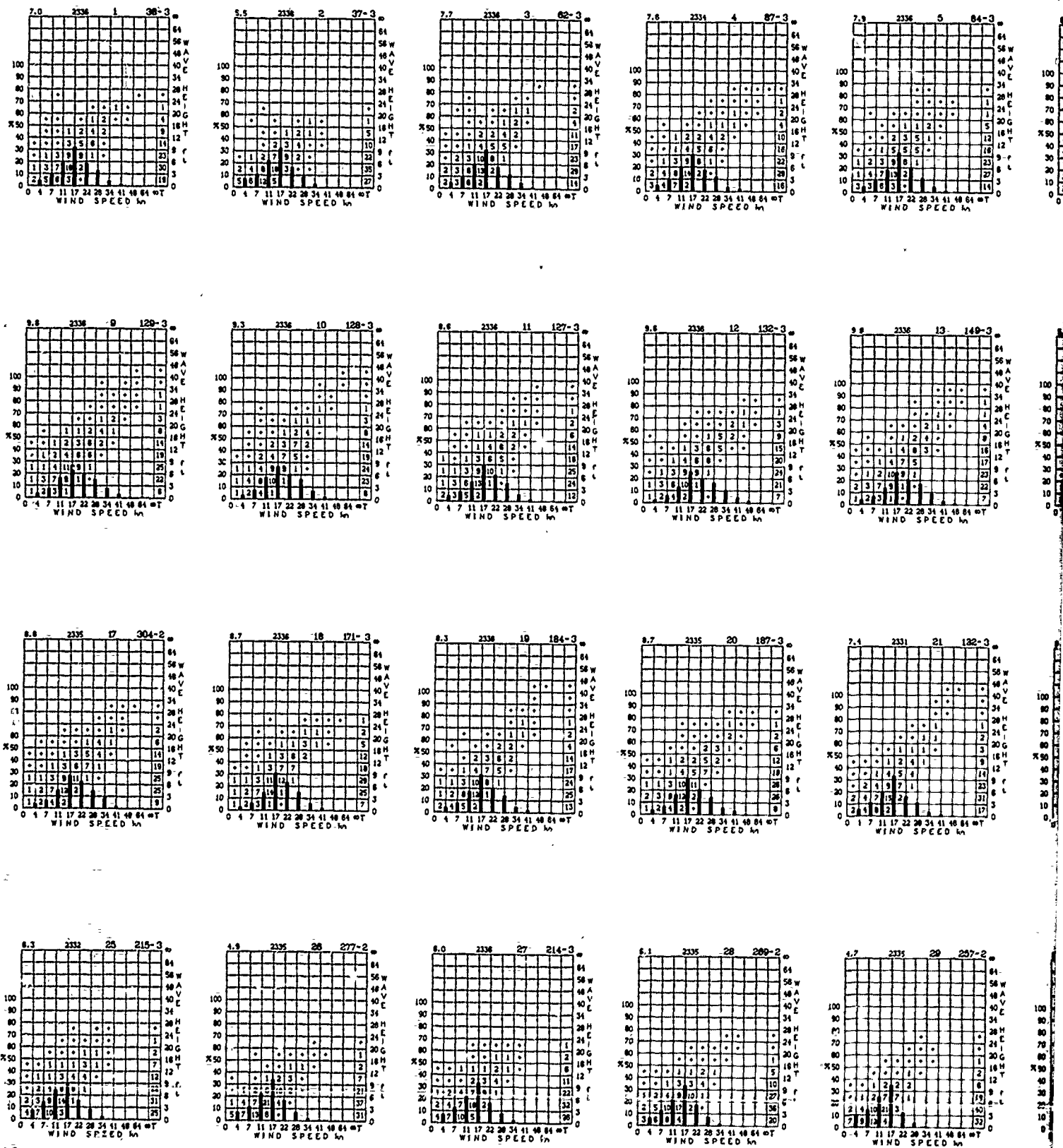
ID (Cont'd)

AUGUST



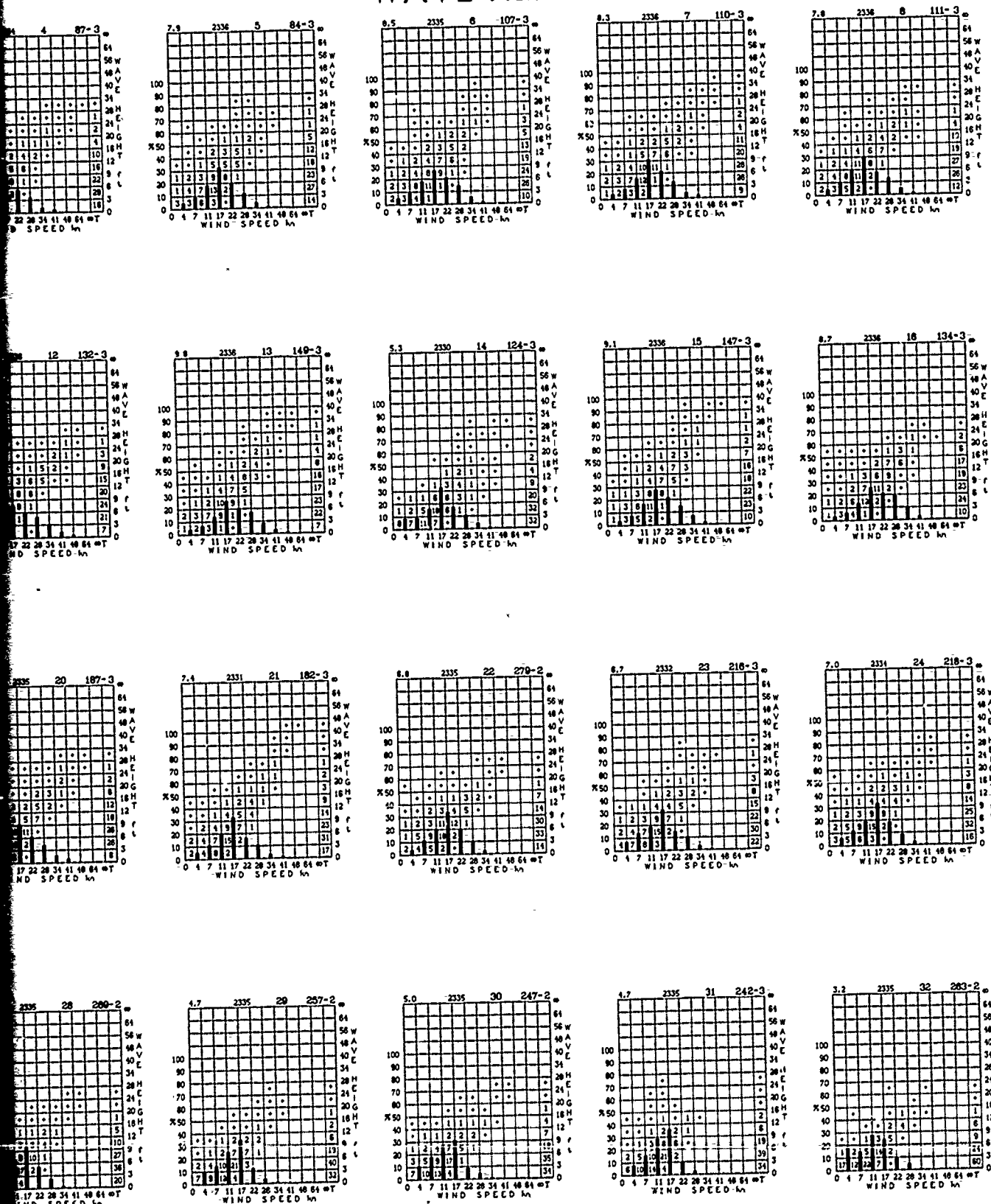
2

# SEPTEMBER

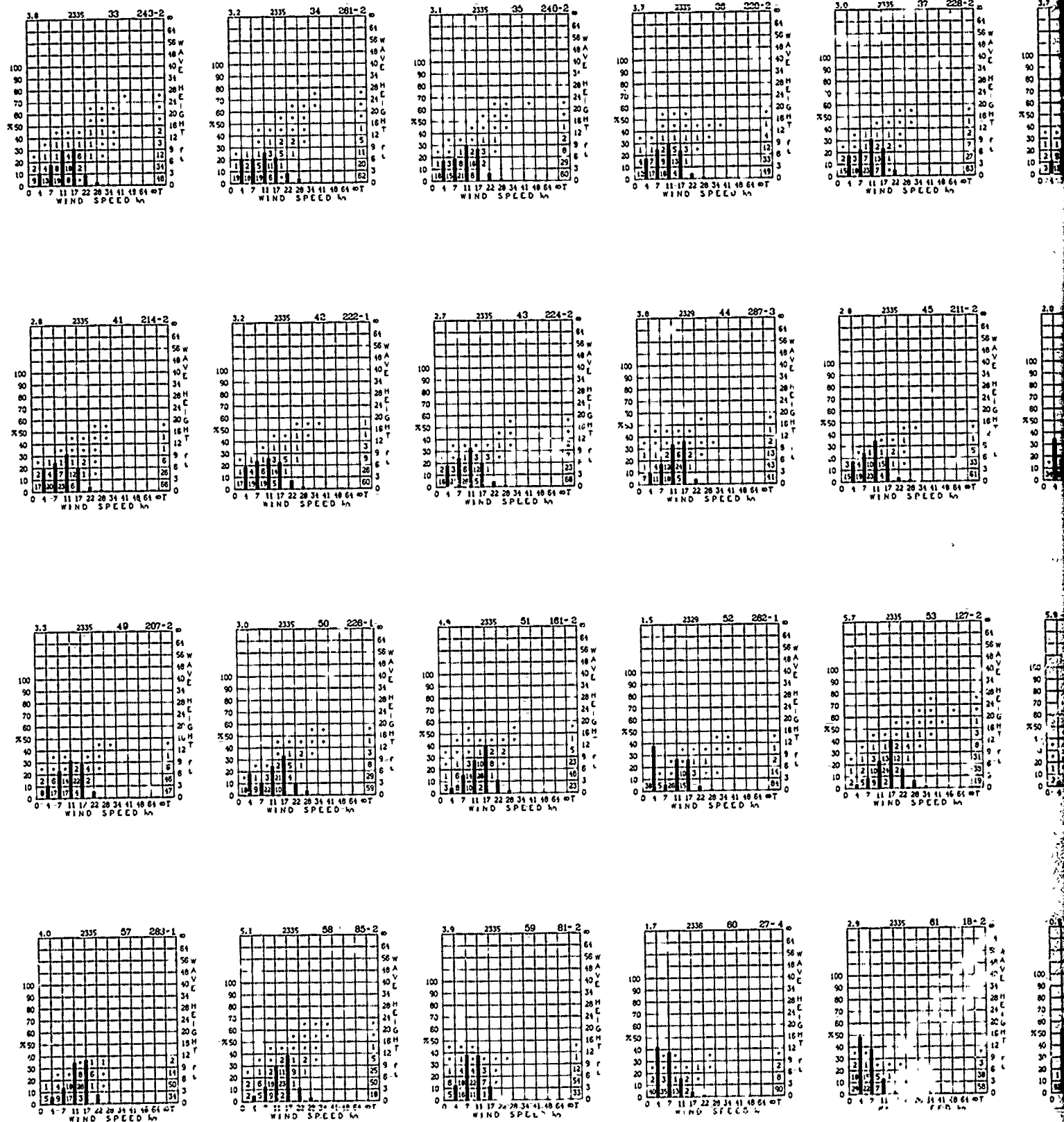




# WAVE HEIGHT AND WIND SPEED



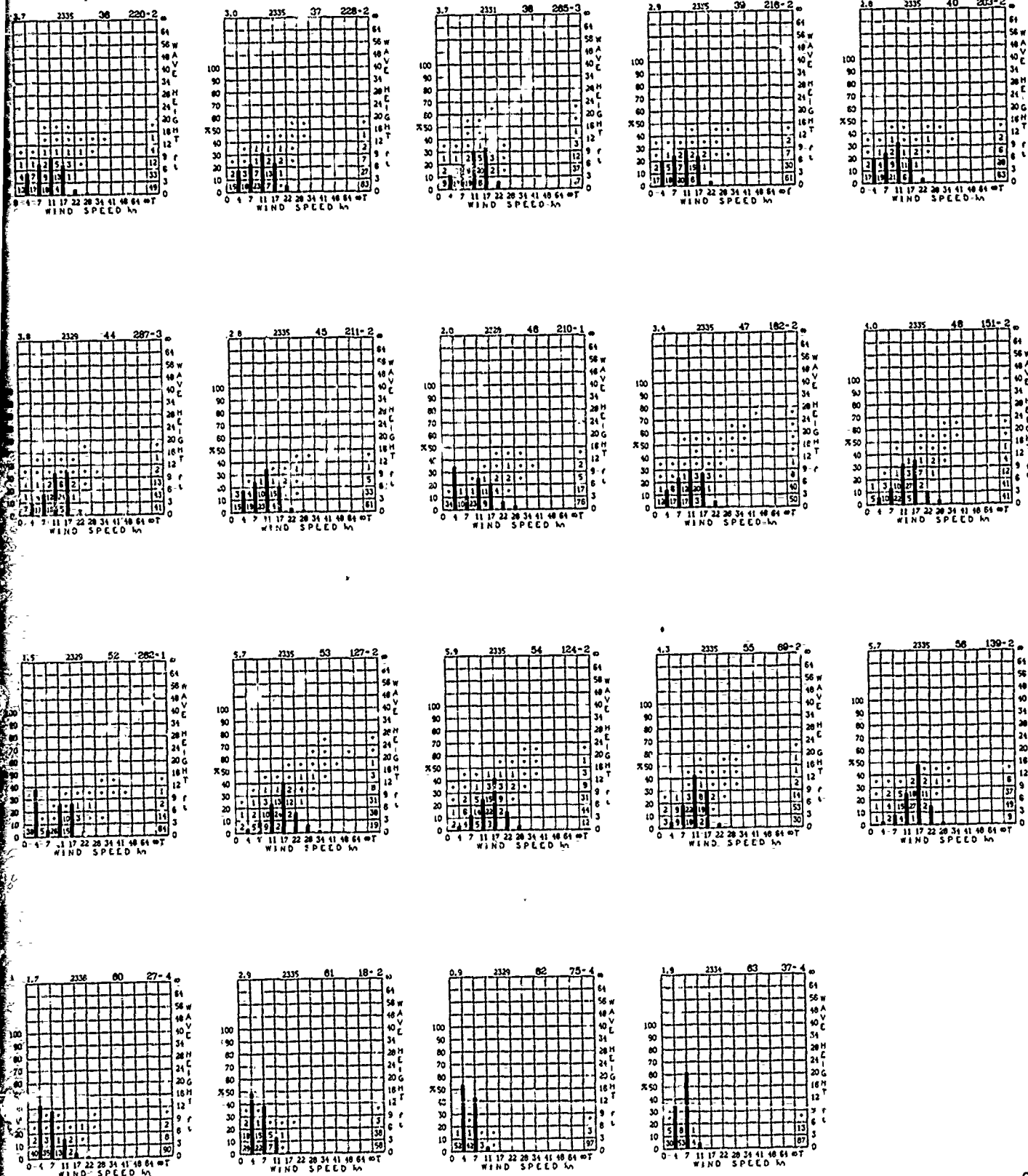
# WAVE HEIGHT AND WIND SPEED (Cont'd)



①

ont'd)

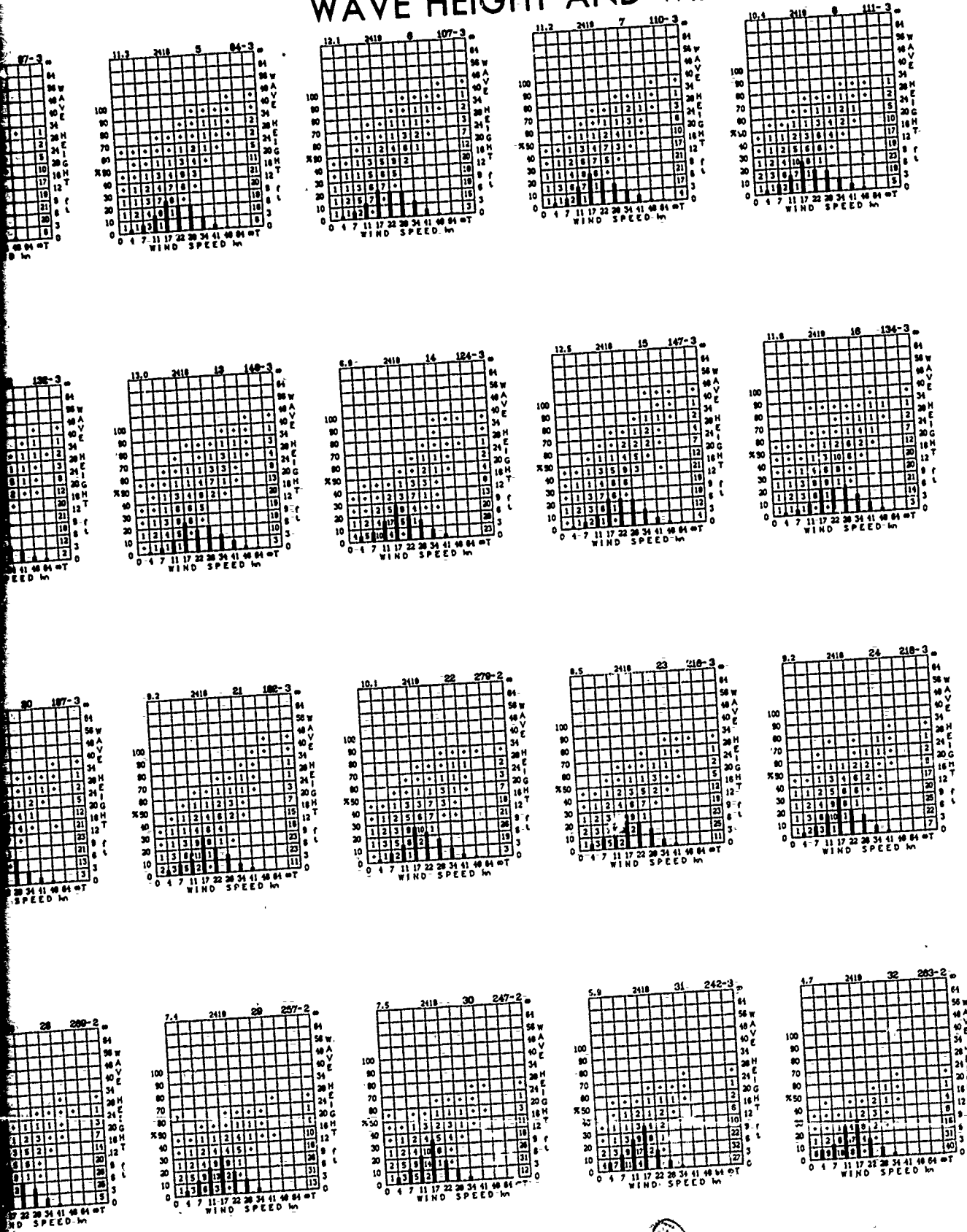
# SEPTEMBER



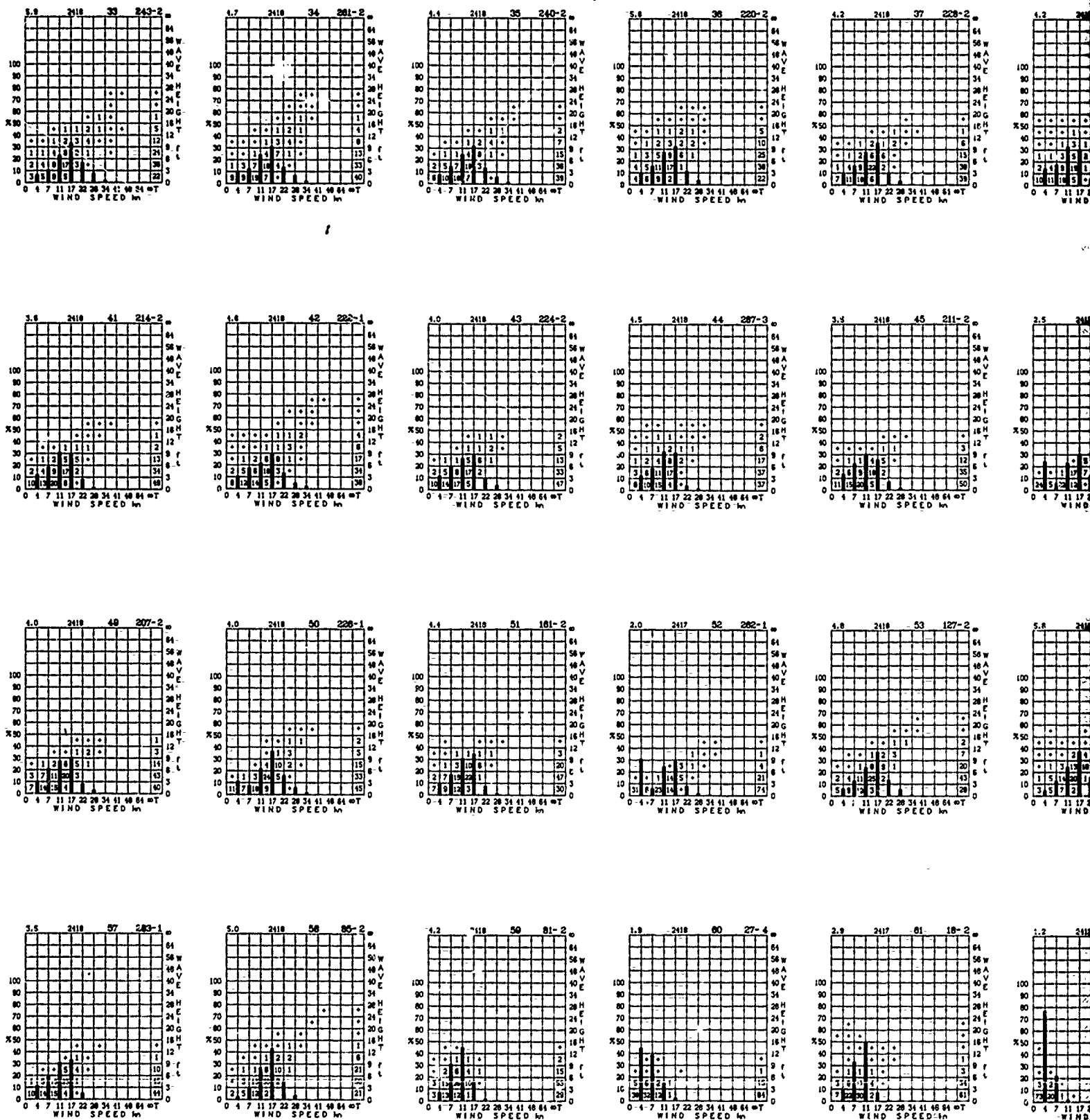
2



# WAVE HEIGHT AND WIND SPEED



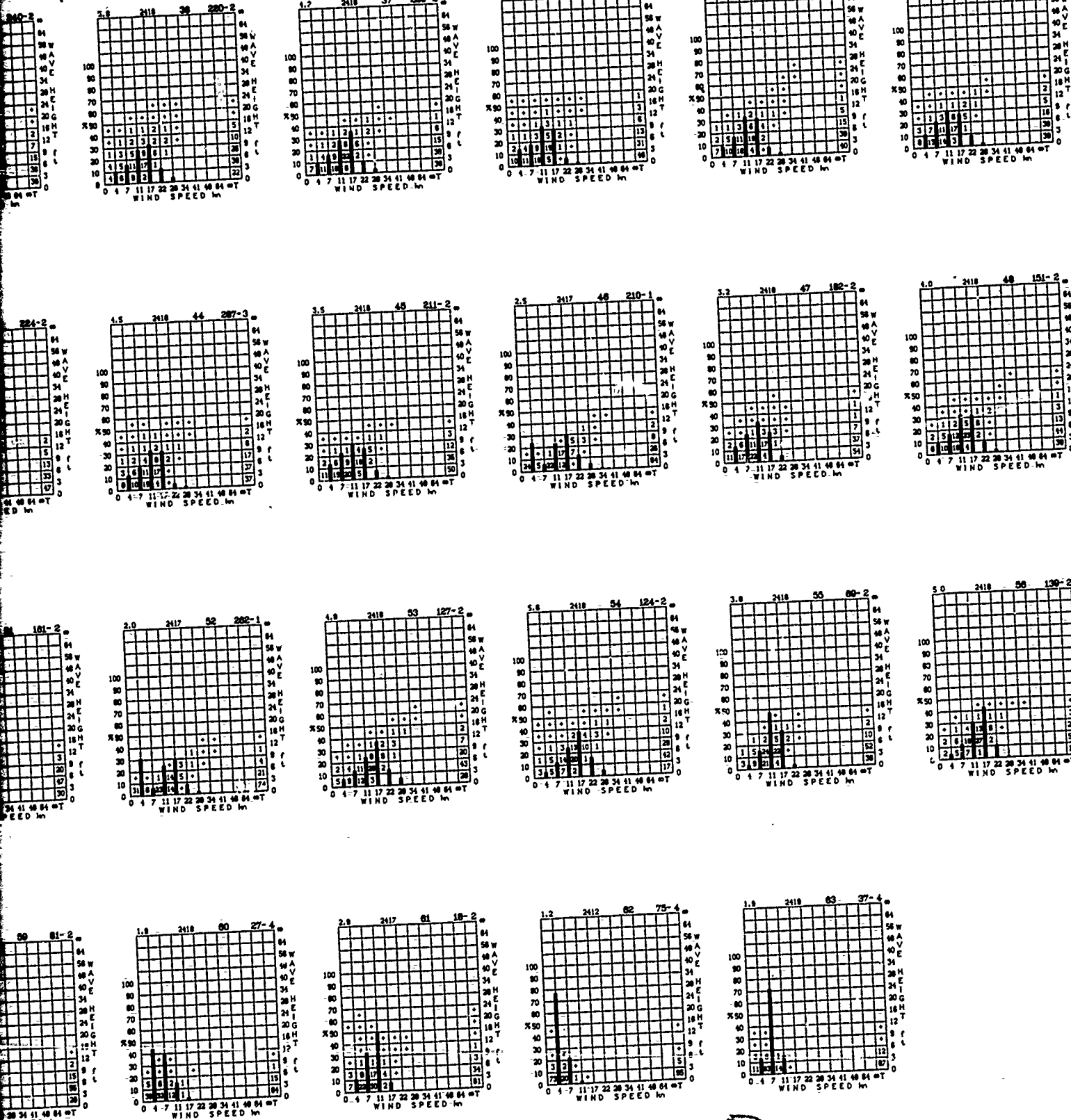
# WAVE HEIGHT AND WIND SPEED (Cont'd)





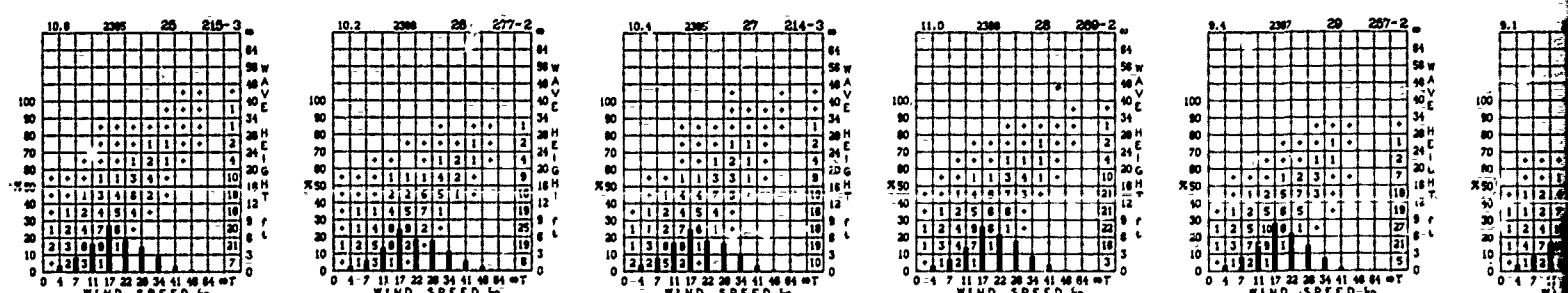
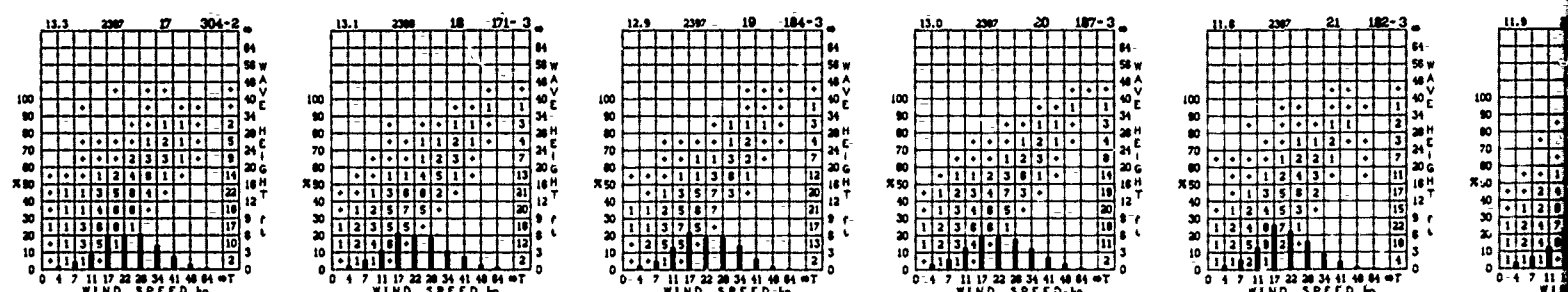
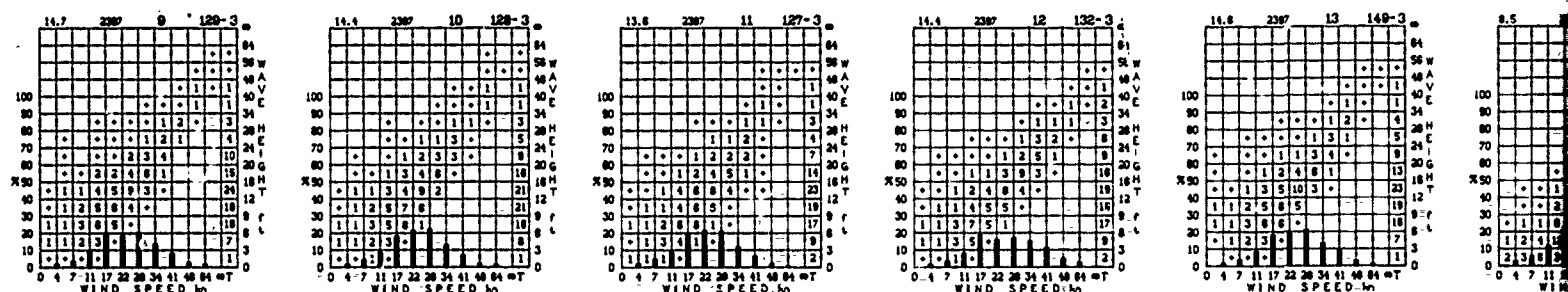
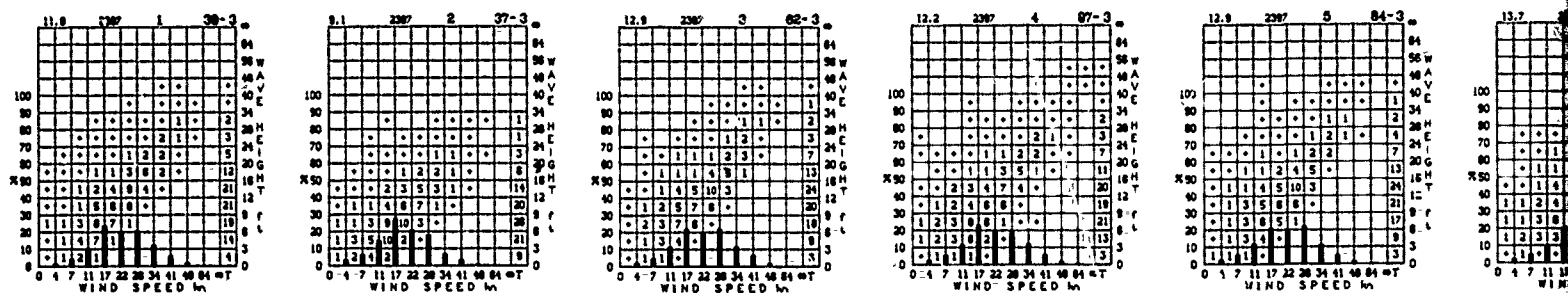
# OCTOBER

## ED (Cont'd)



# NOVEMBER

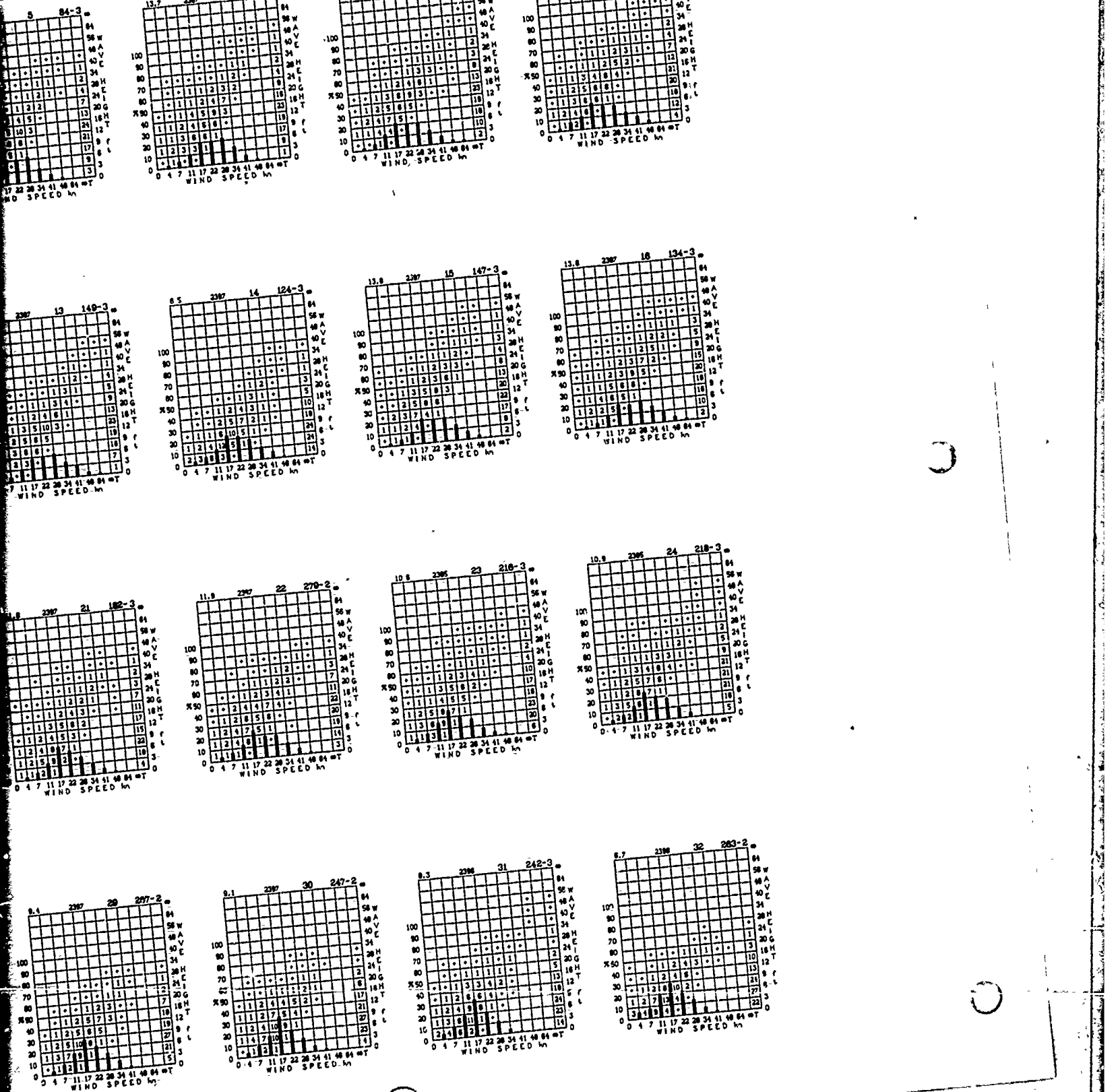
WA



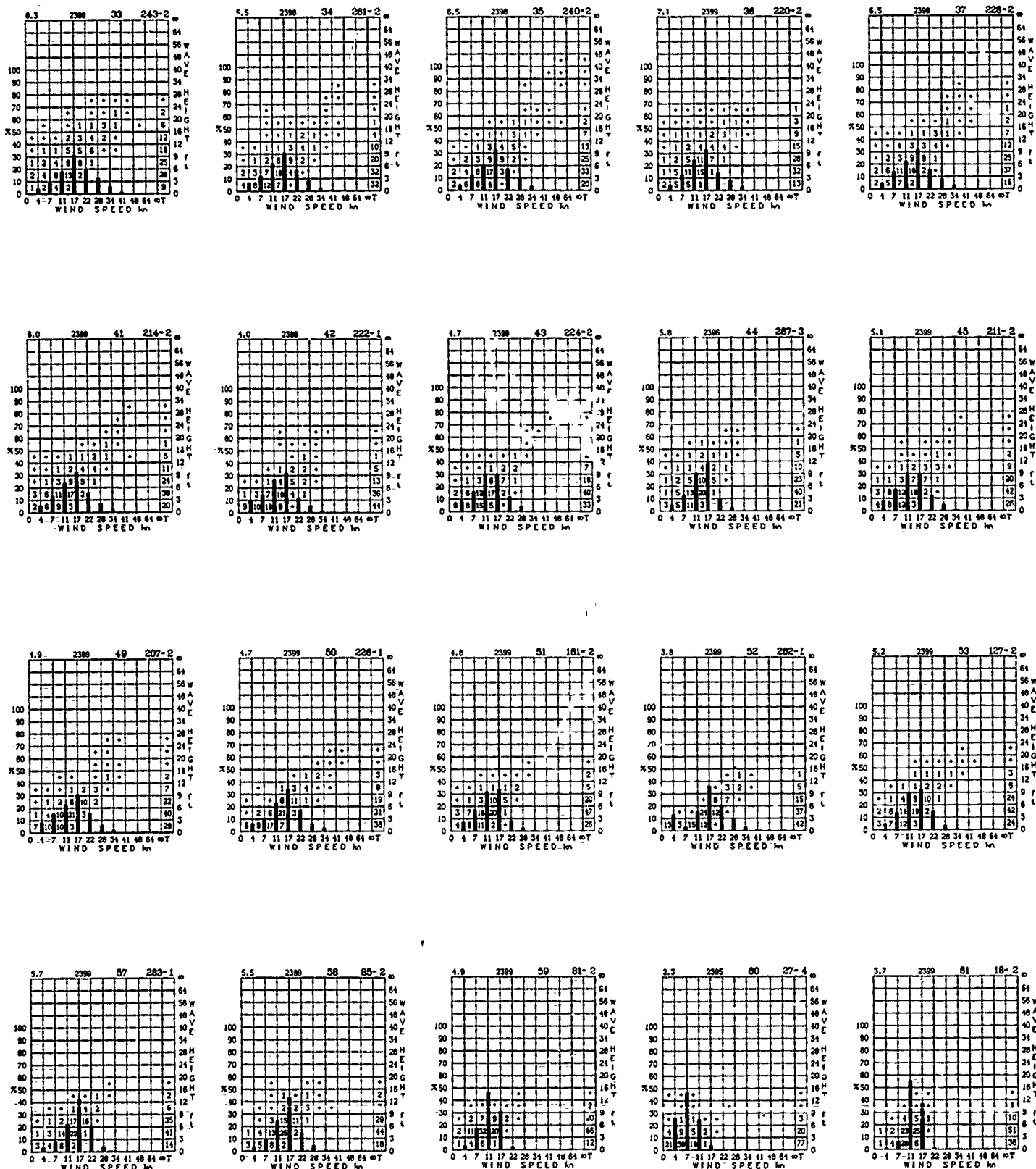
①



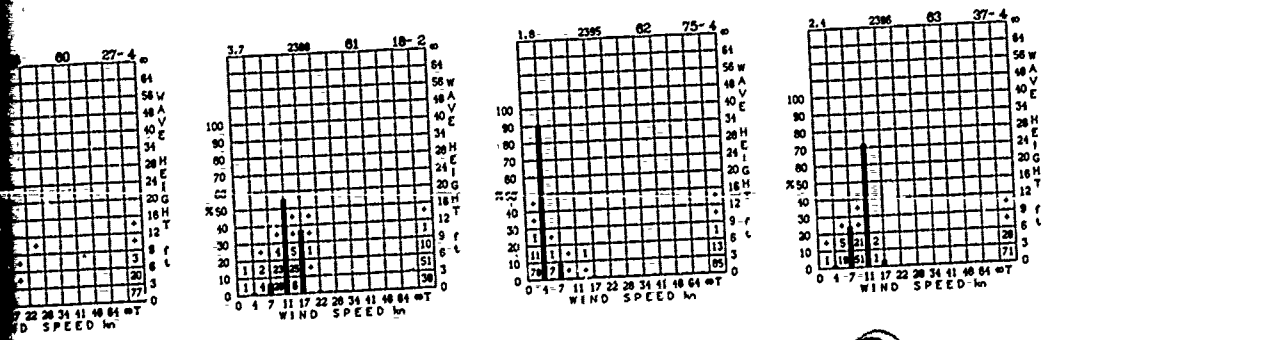
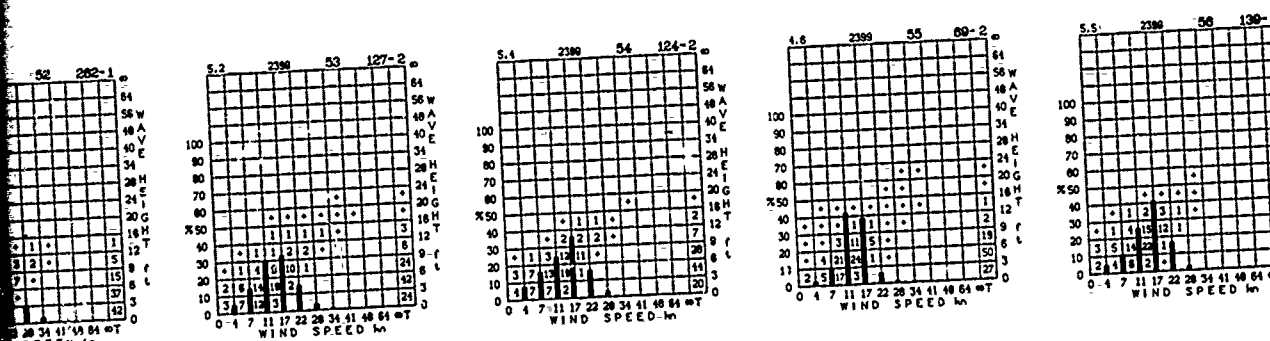
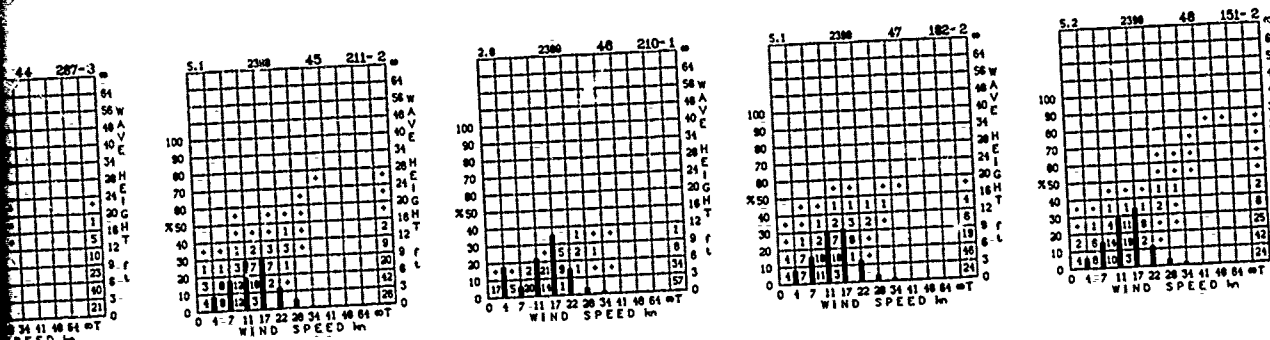
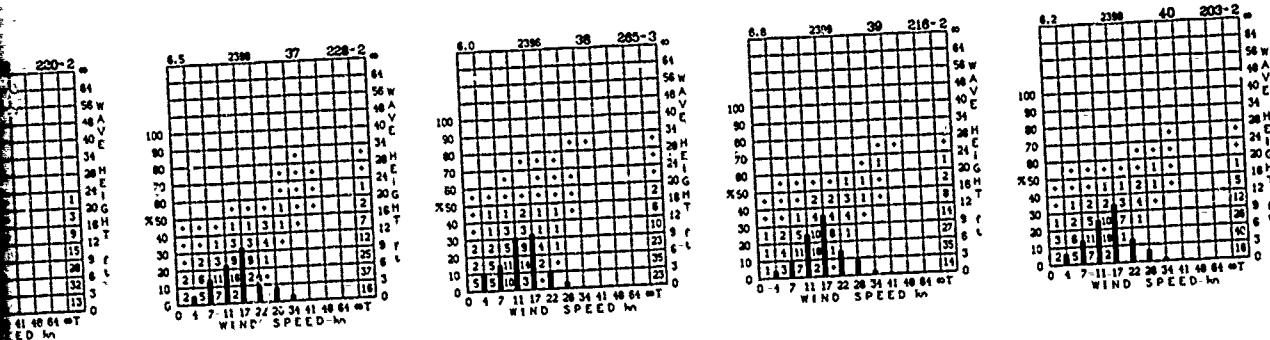
# WAVE HEIGHT AND WIND SPEED



# WAVE HEIGHT AND WIND SPEED (Cont'd)

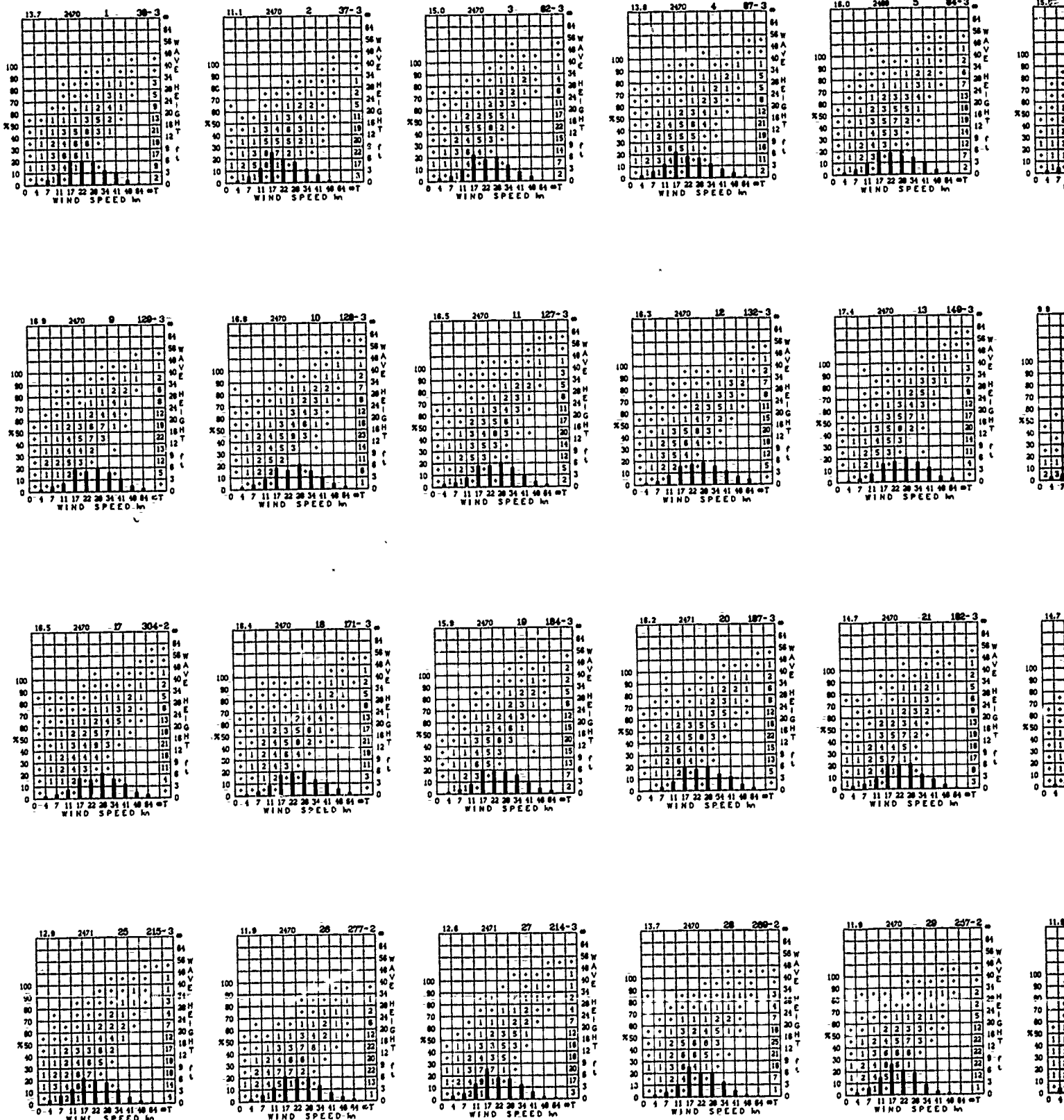


# NOVEMBER

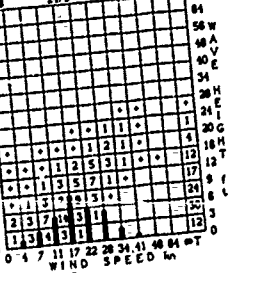
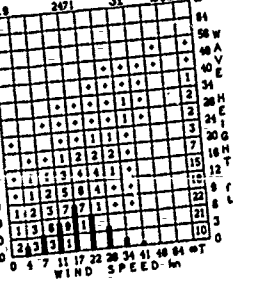
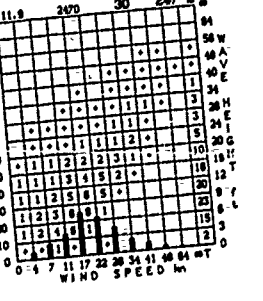
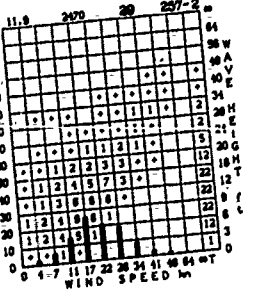
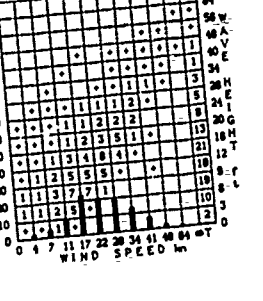
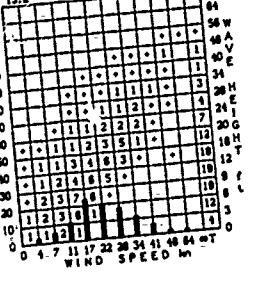
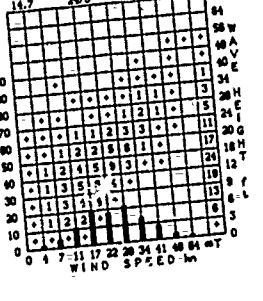
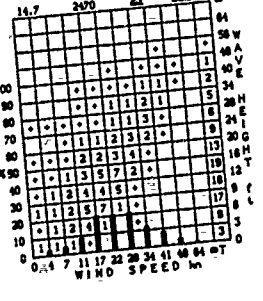
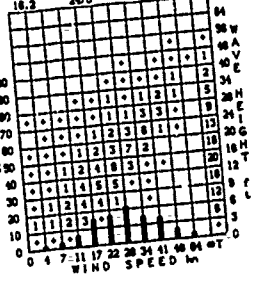
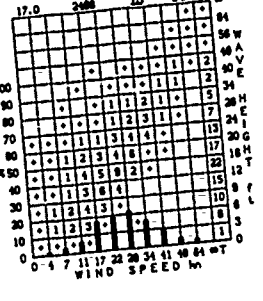
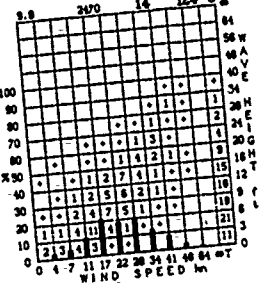
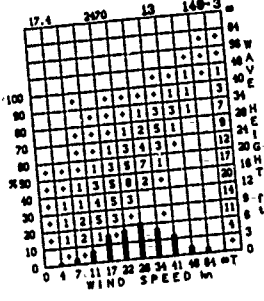
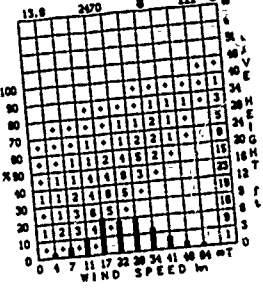
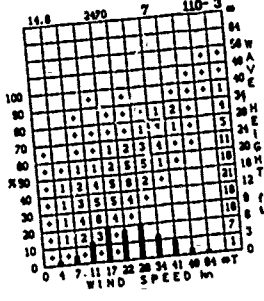
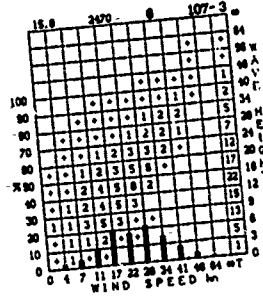
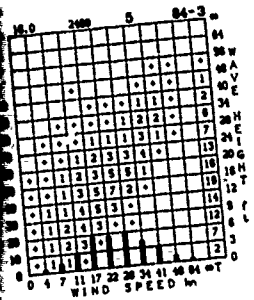


# DECEMBER

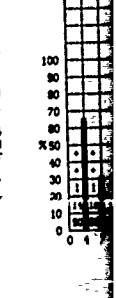
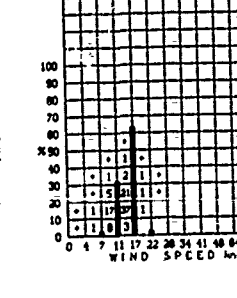
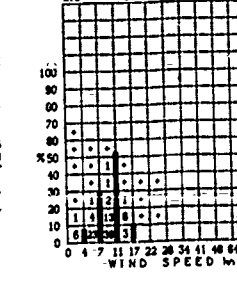
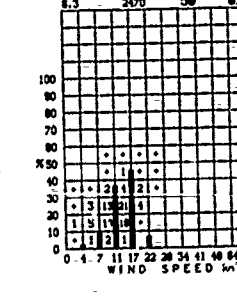
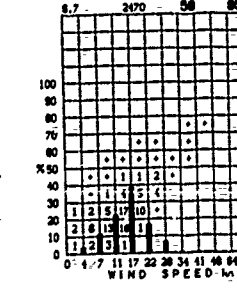
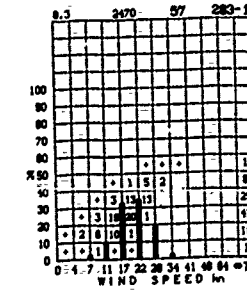
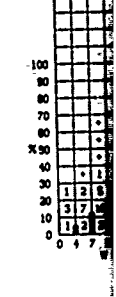
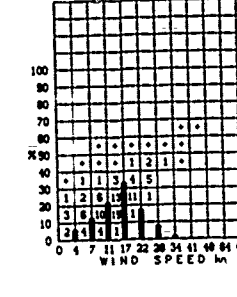
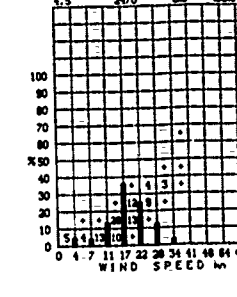
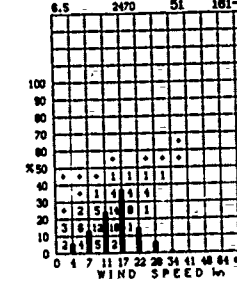
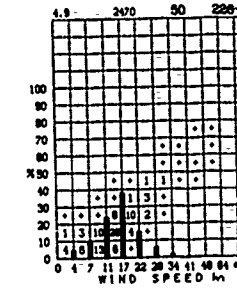
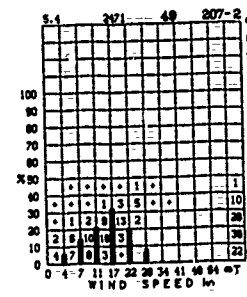
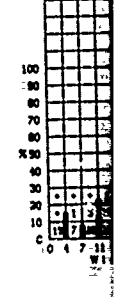
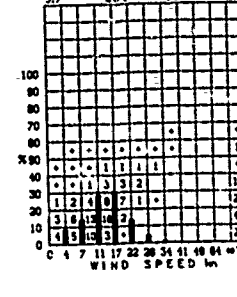
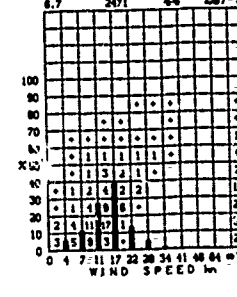
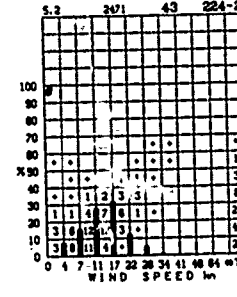
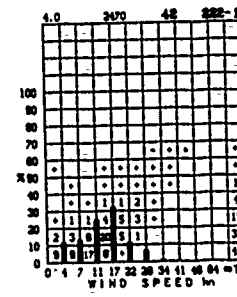
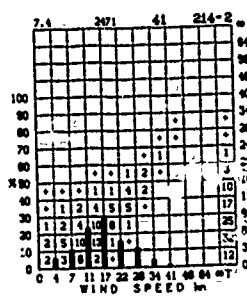
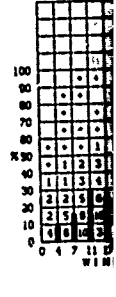
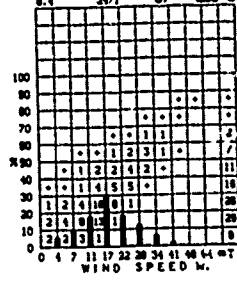
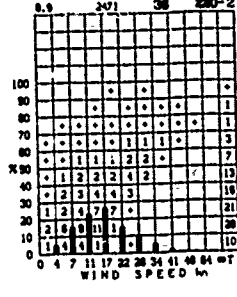
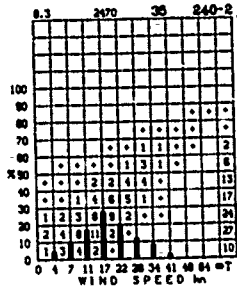
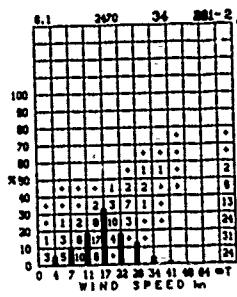
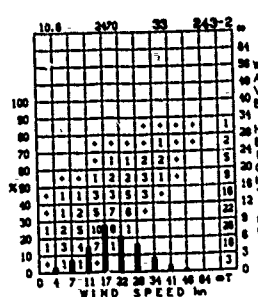
WA



# WAVE HEIGHT AND WIND SPEED



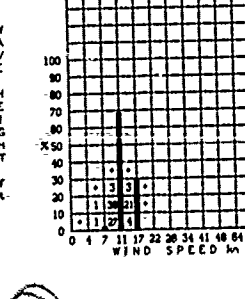
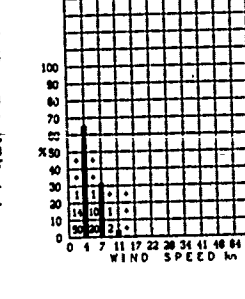
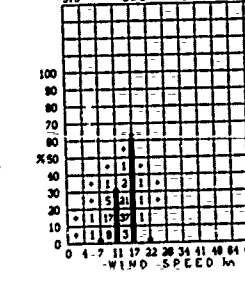
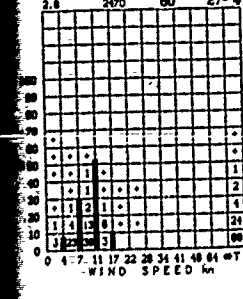
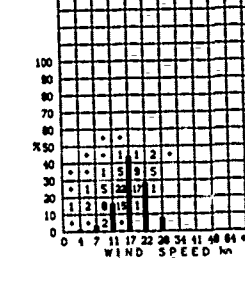
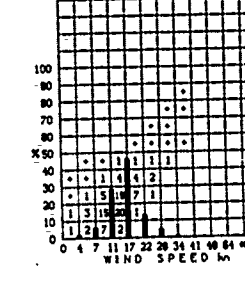
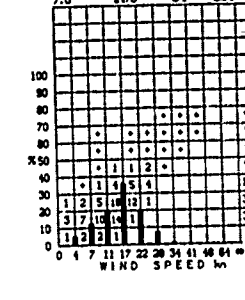
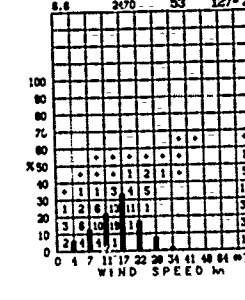
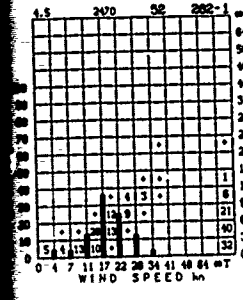
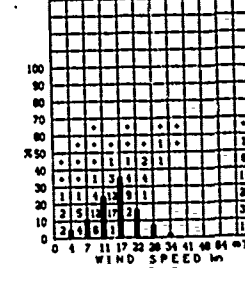
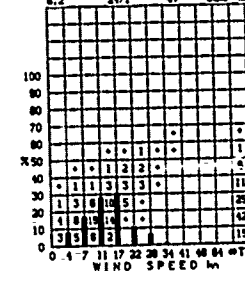
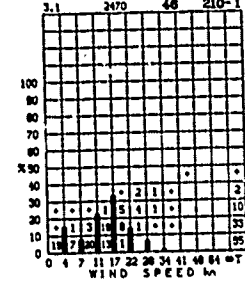
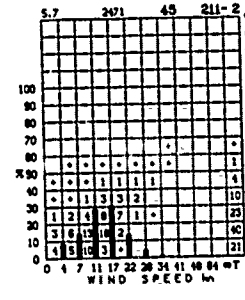
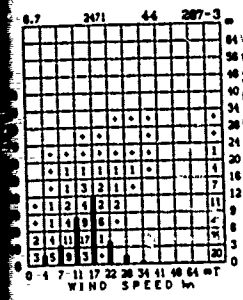
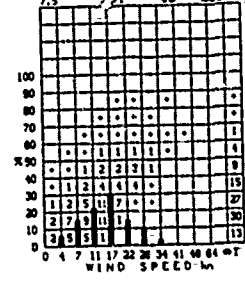
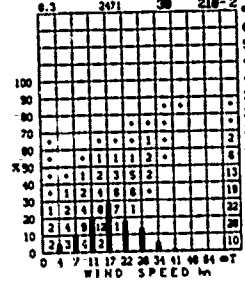
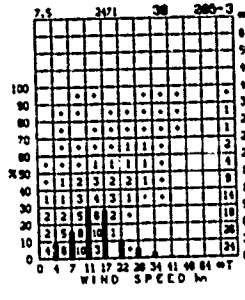
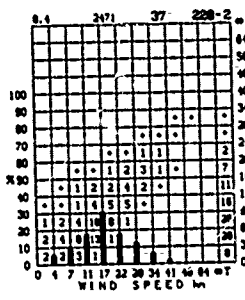
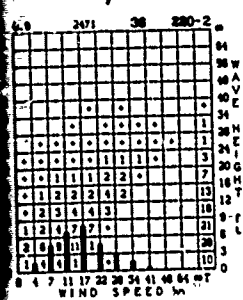
# WAVE HEIGHT AND WIND SPEED (Cont'd)





ont'd)

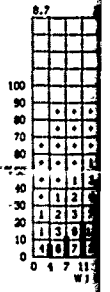
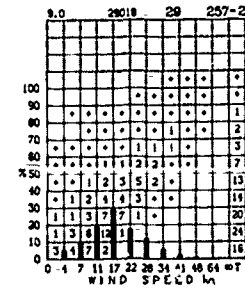
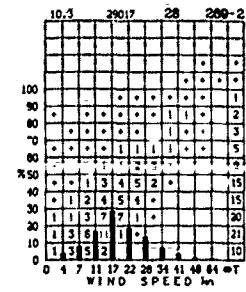
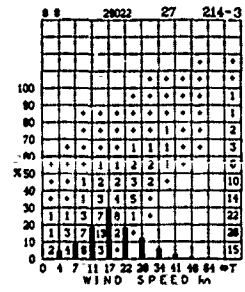
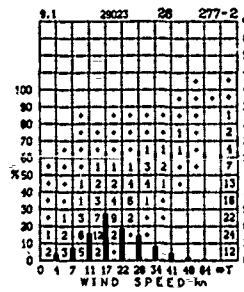
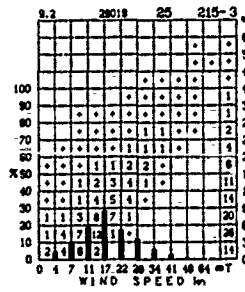
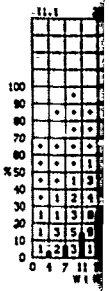
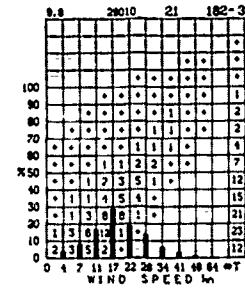
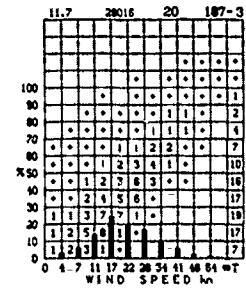
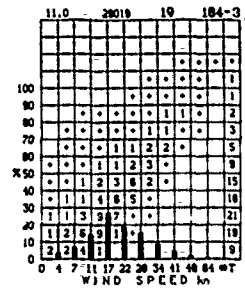
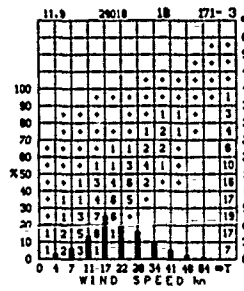
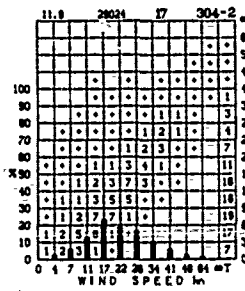
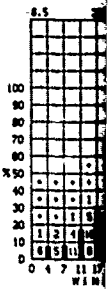
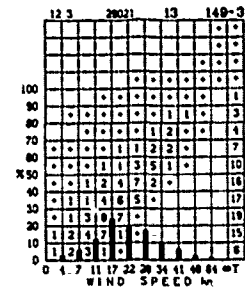
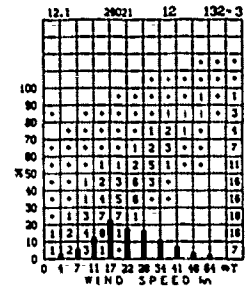
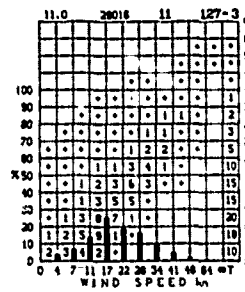
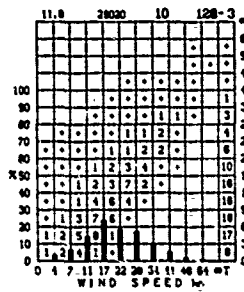
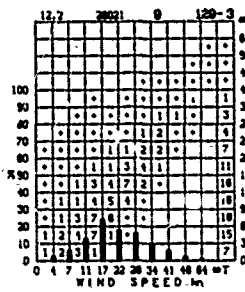
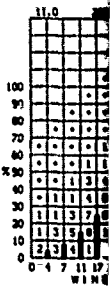
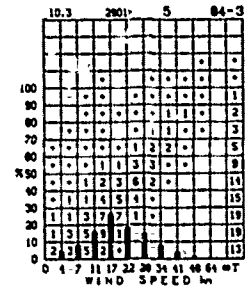
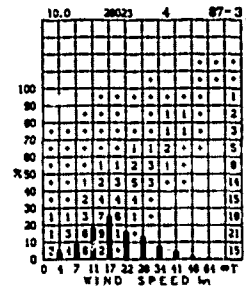
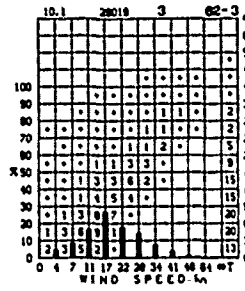
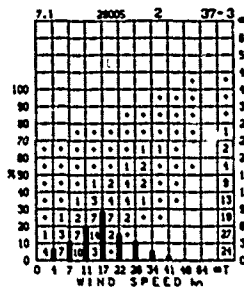
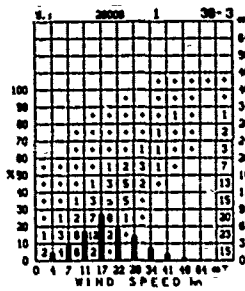
# DECEMBER



(2)

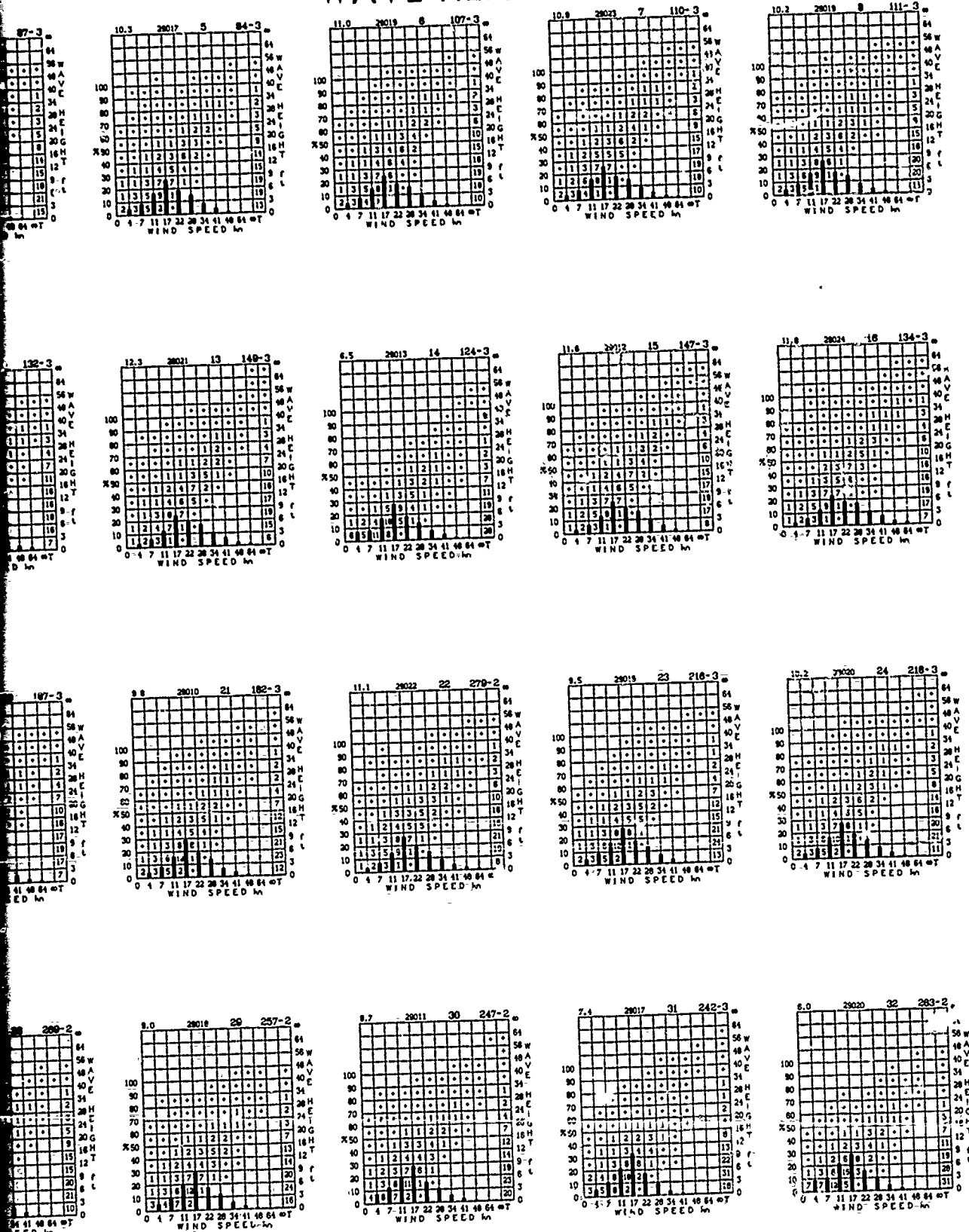
# ANNUAL

# WAY

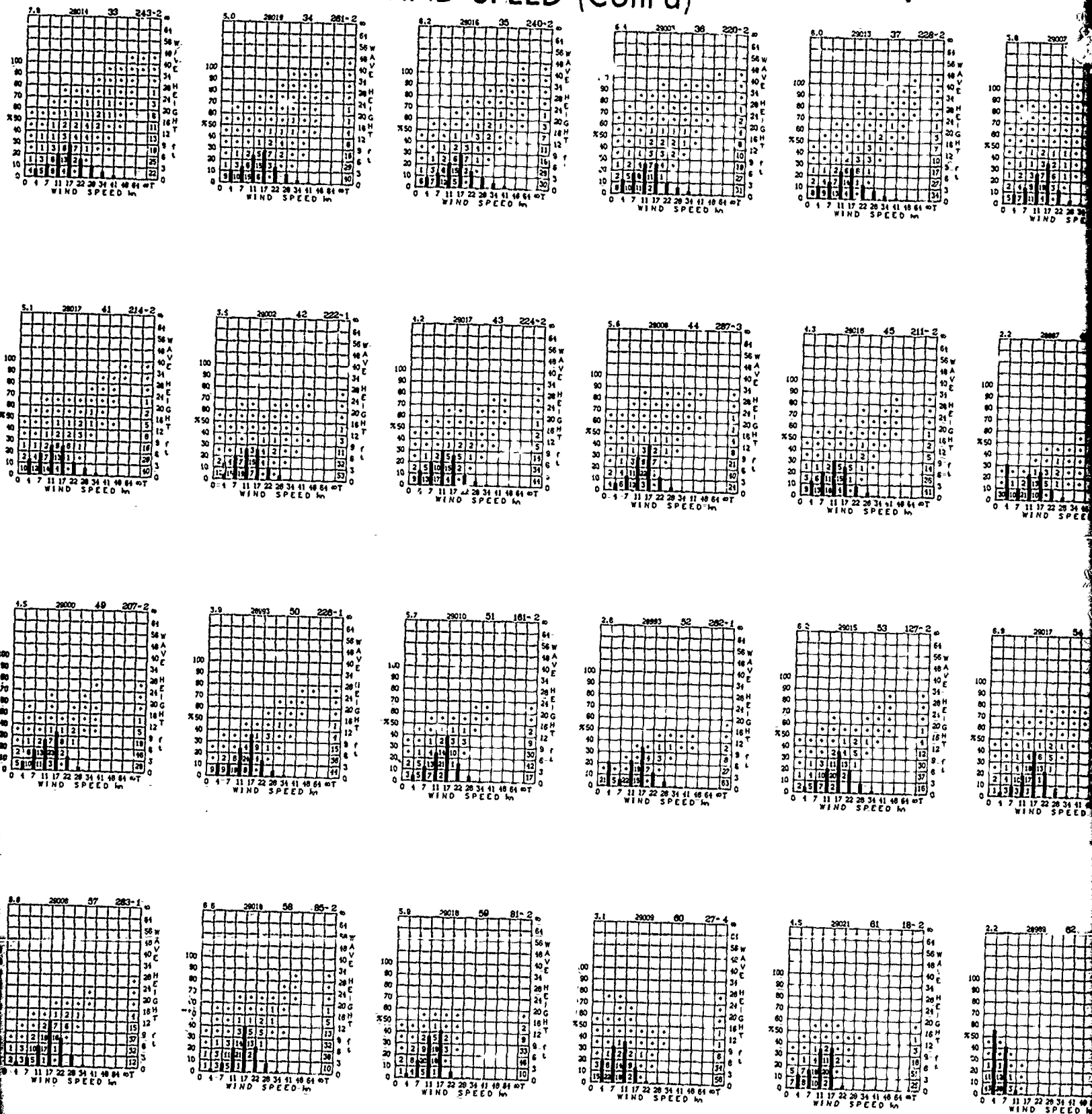




# WAVE HEIGHT AND WIND SPEED

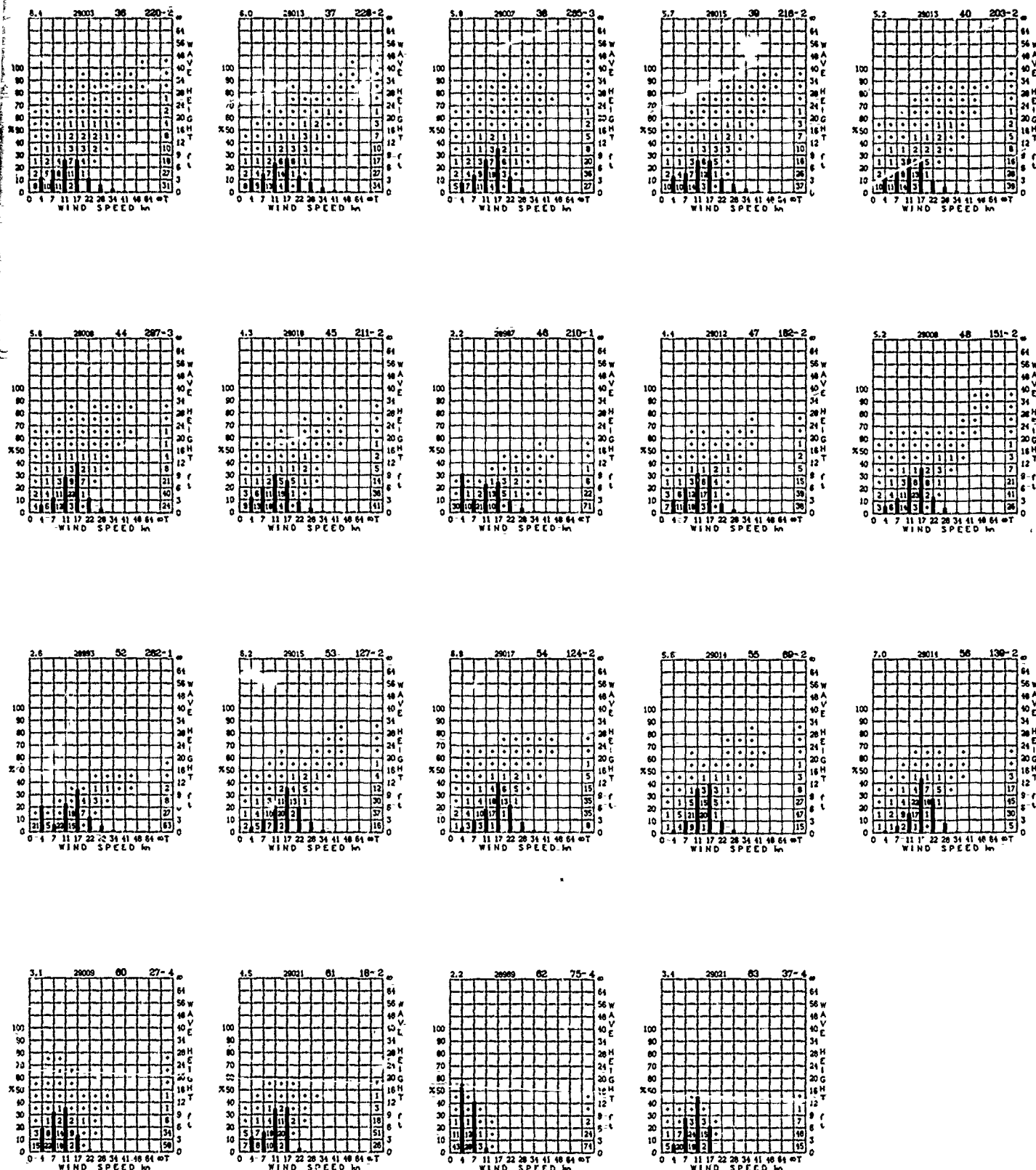


# WAVE HEIGHT AND WIND SPEED (Cont'd)



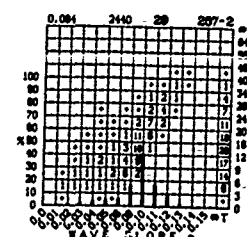
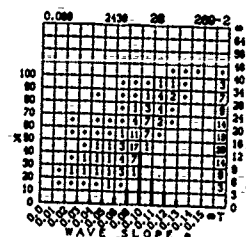
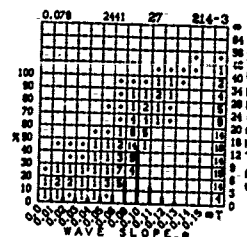
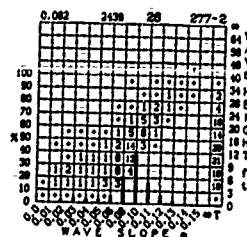
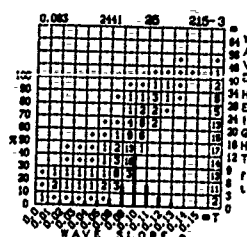
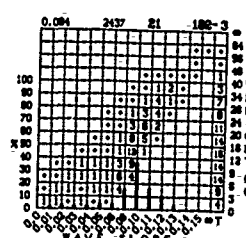
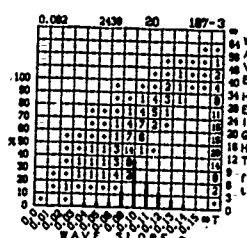
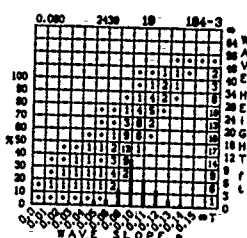
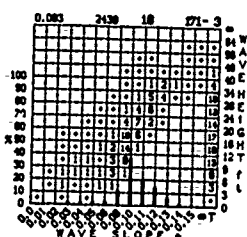
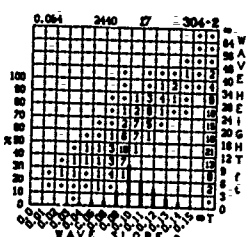
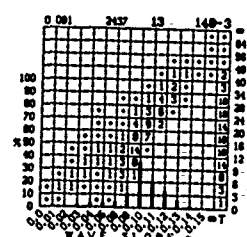
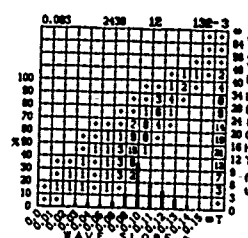
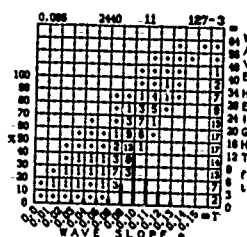
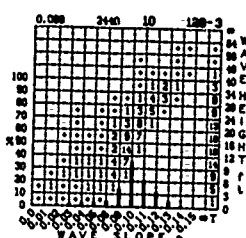
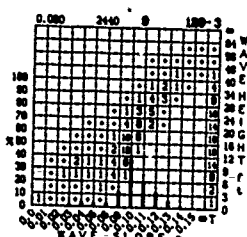
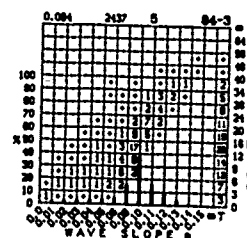
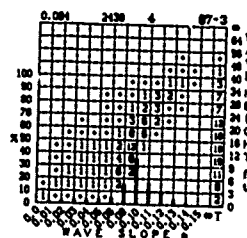
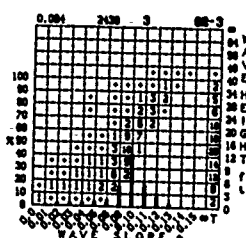
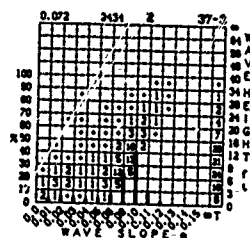
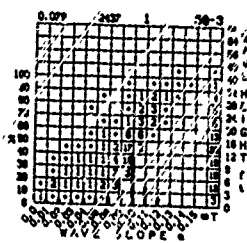
Cont'd)

ANNUAL

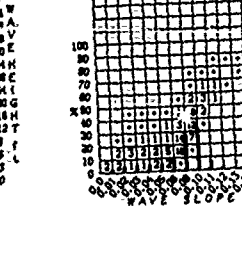
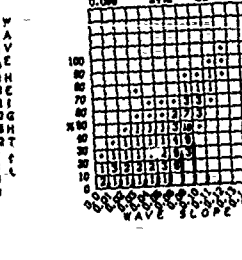
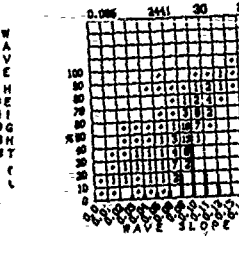
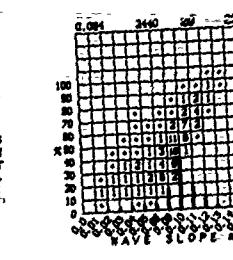
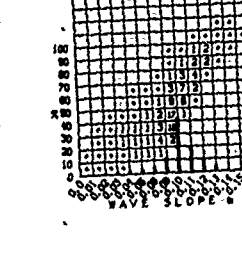
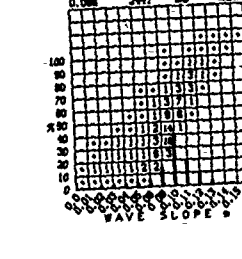
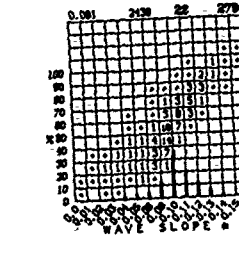
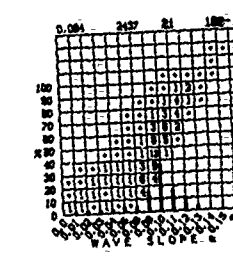
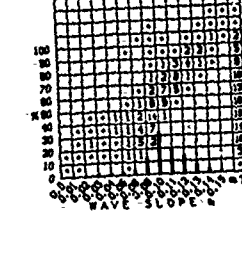
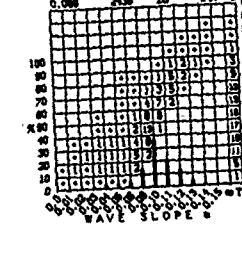
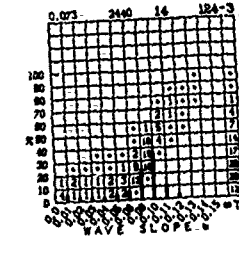
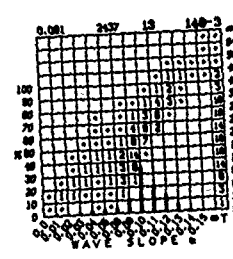
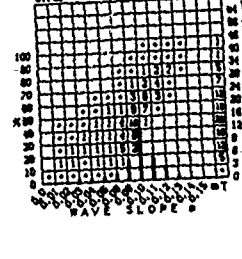
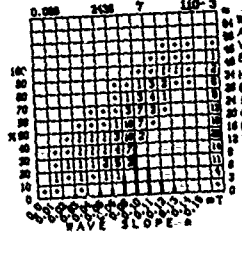
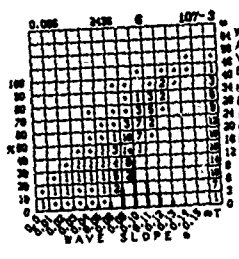
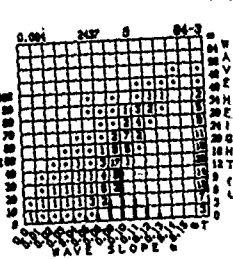


# JANUARY

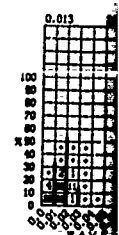
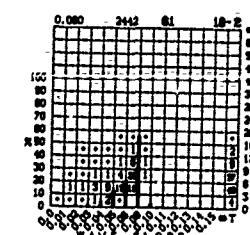
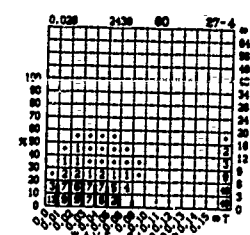
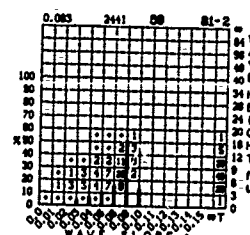
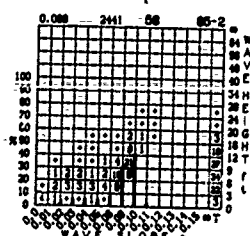
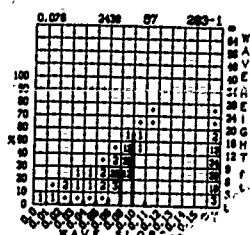
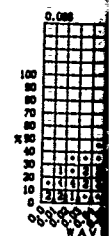
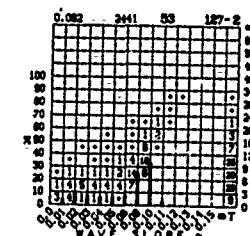
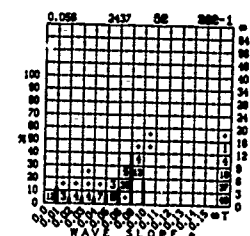
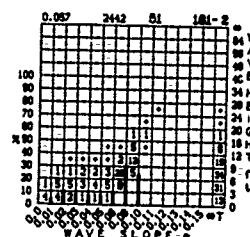
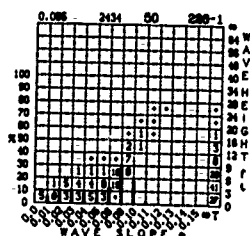
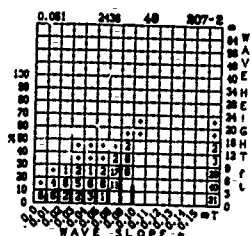
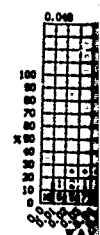
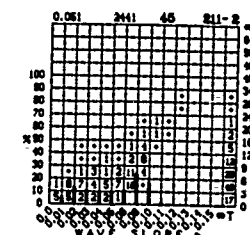
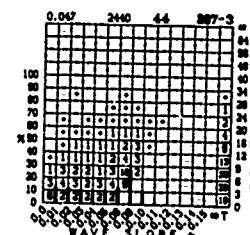
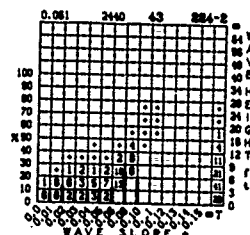
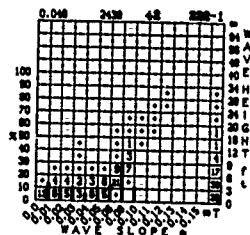
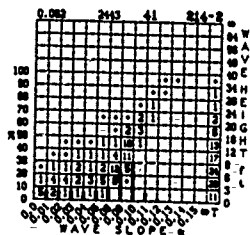
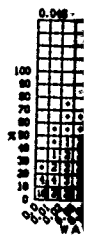
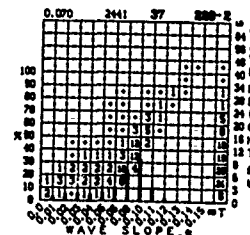
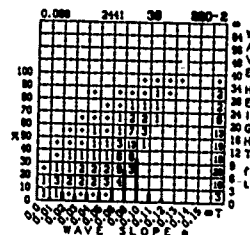
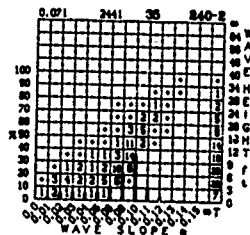
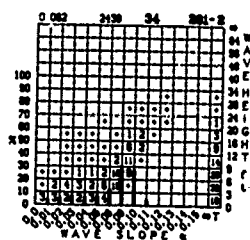
WAV



# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )



## WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)

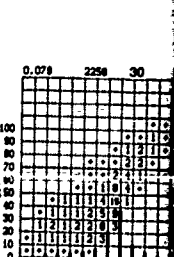
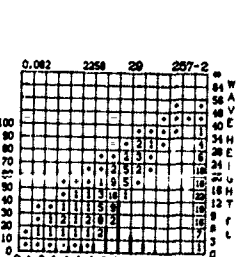
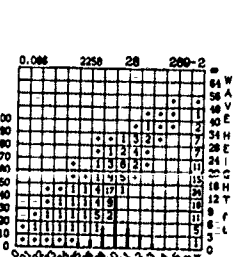
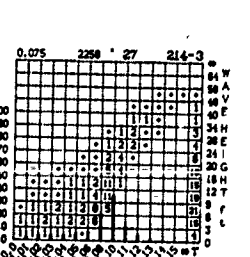
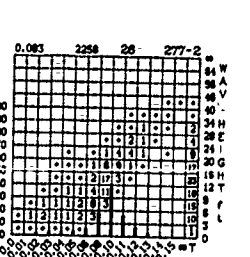
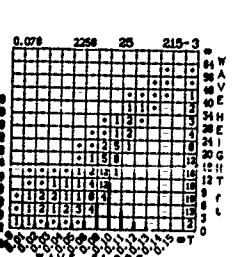
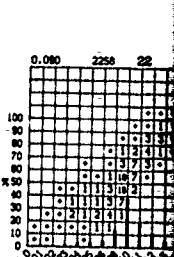
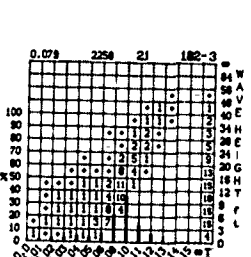
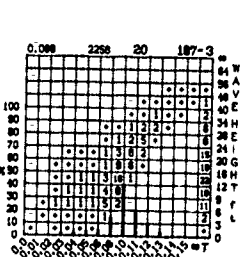
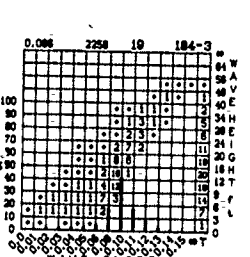
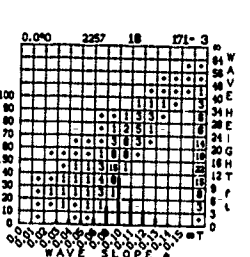
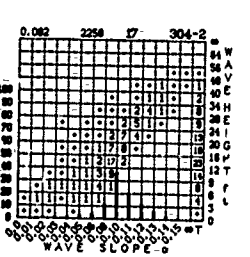
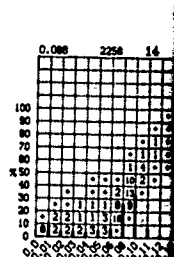
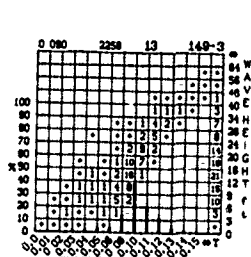
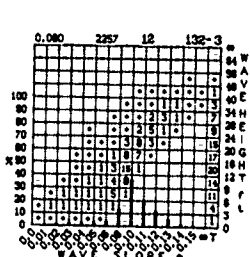
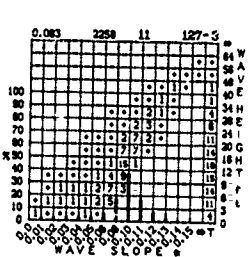
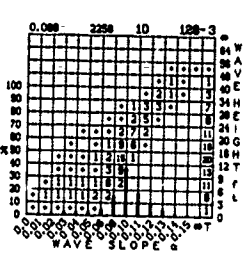
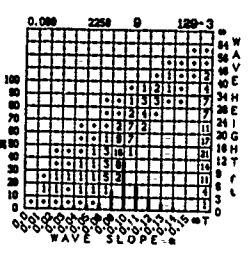
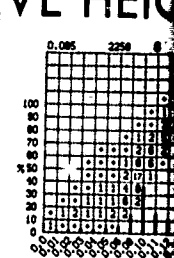
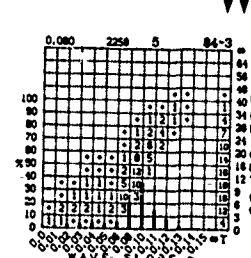
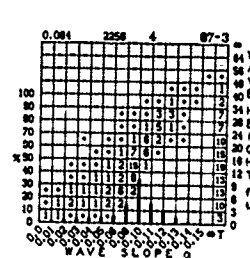
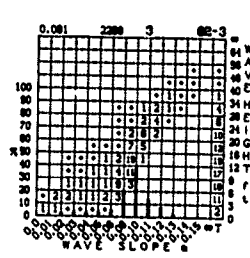
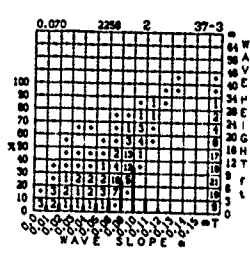
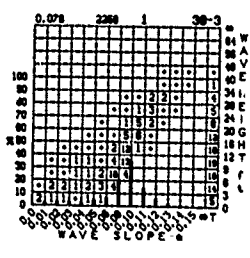






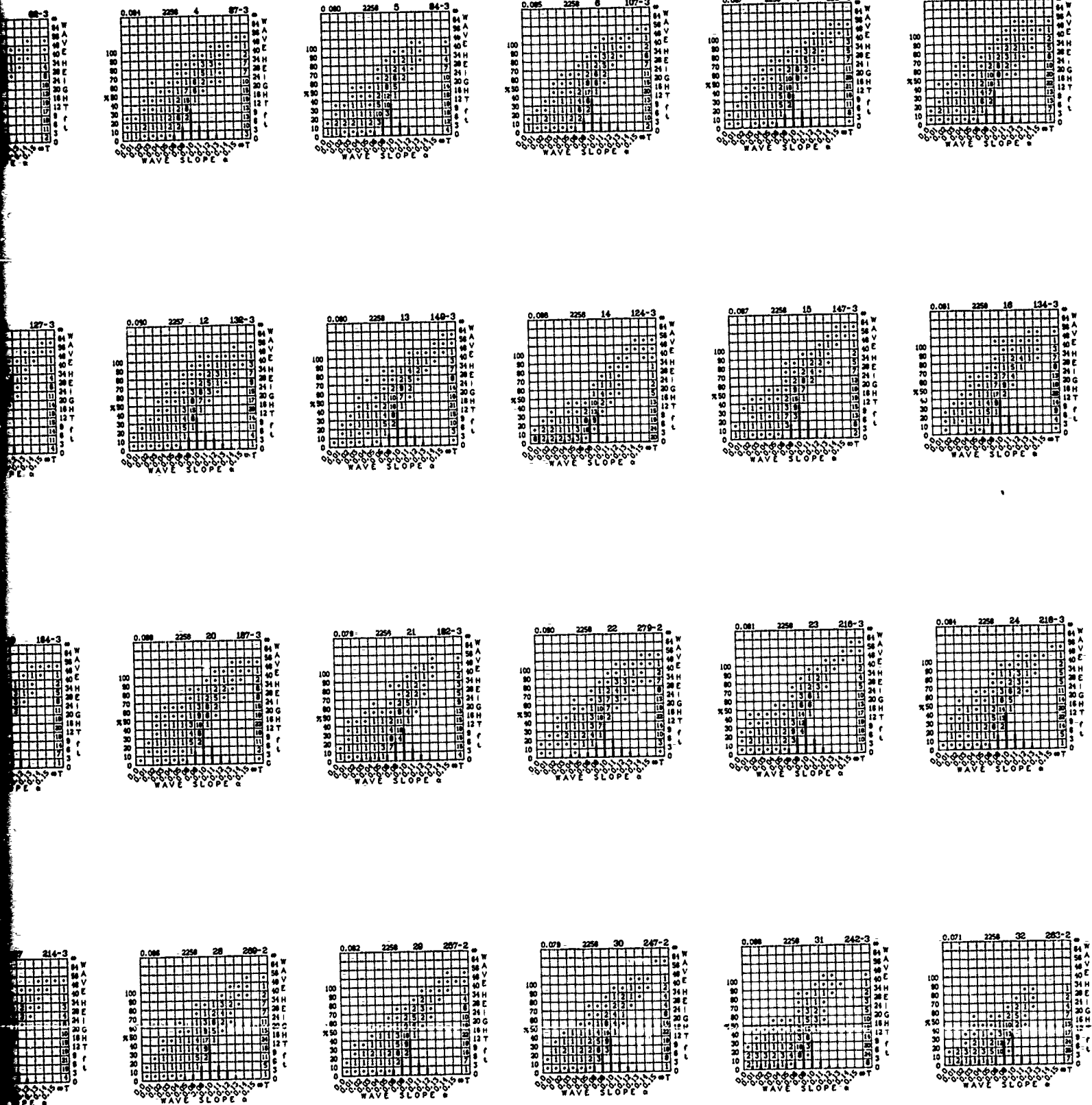
# FEBRUARY

# WAVE HEIGHT

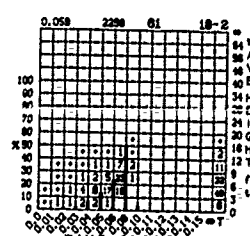
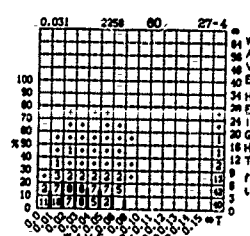
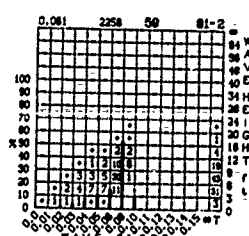
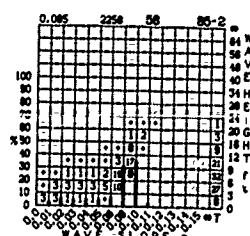
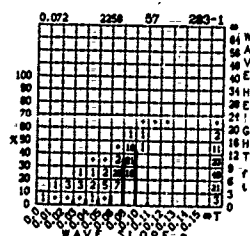
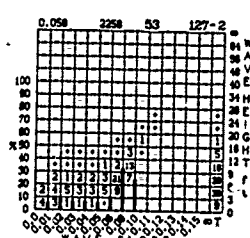
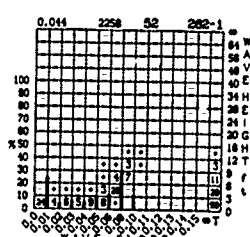
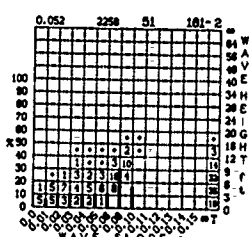
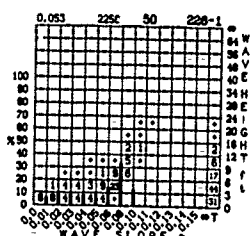
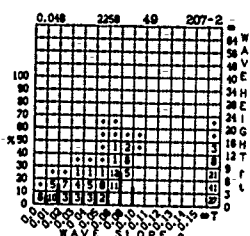
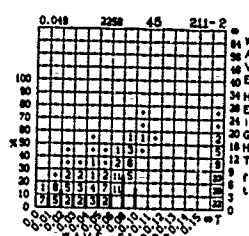
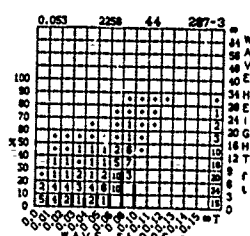
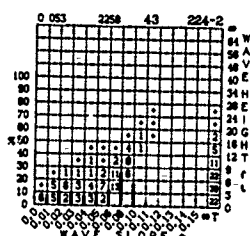
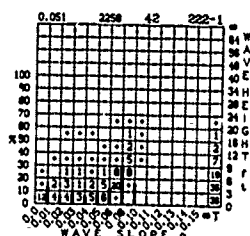
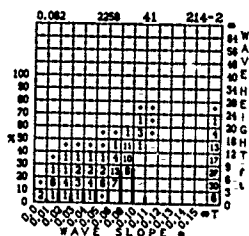
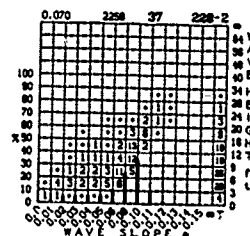
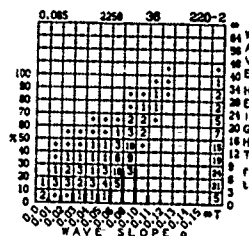
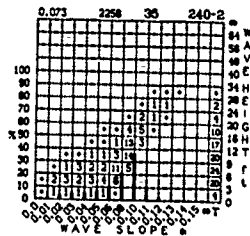
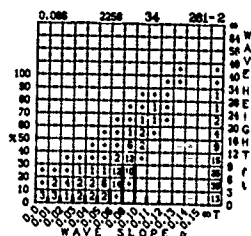
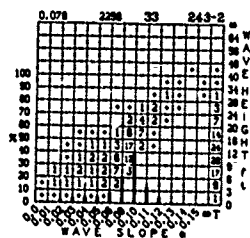




# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )

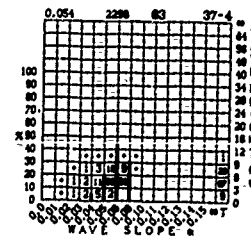
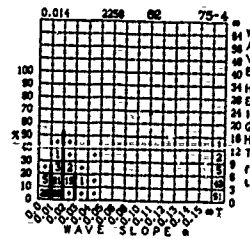
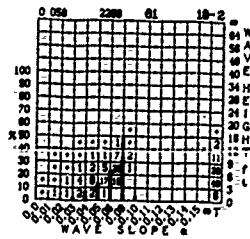
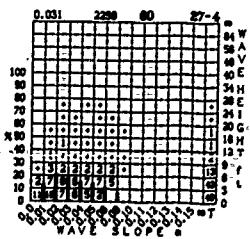
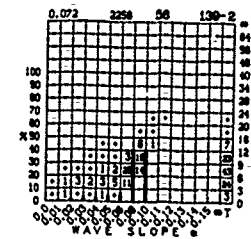
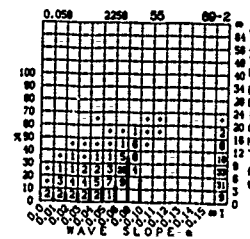
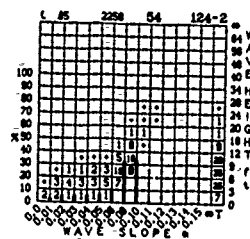
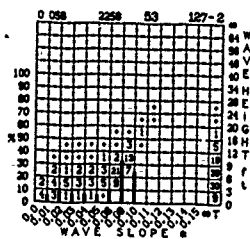
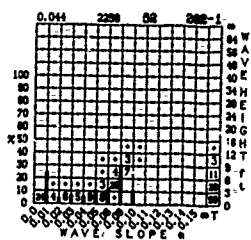
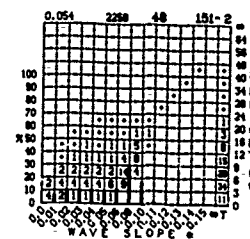
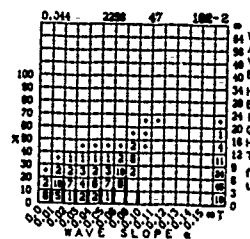
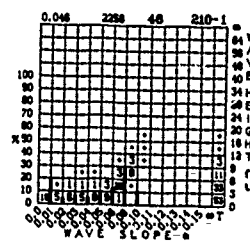
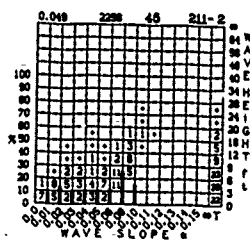
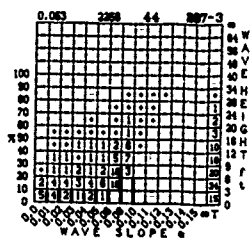
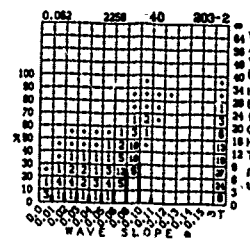
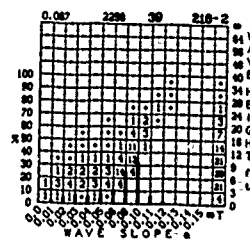
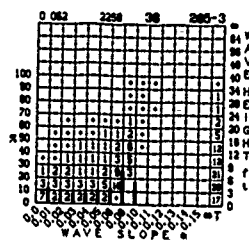
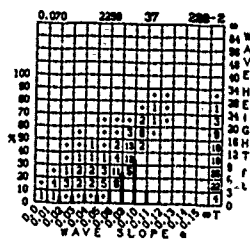
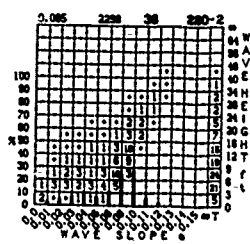


# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



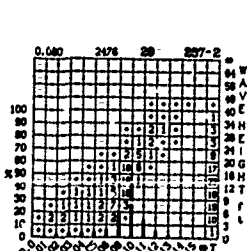
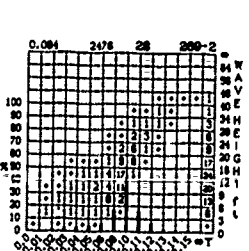
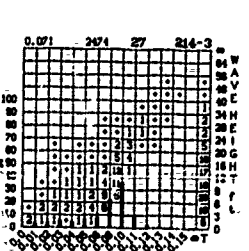
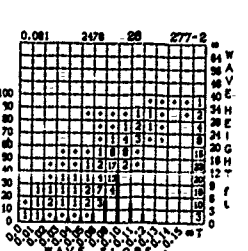
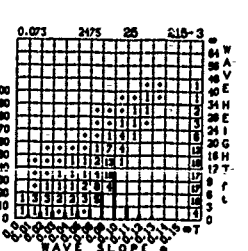
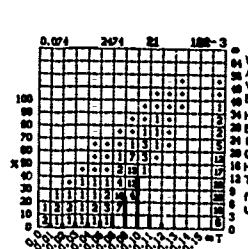
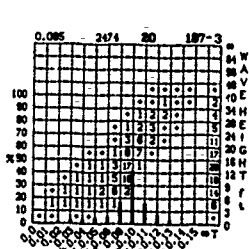
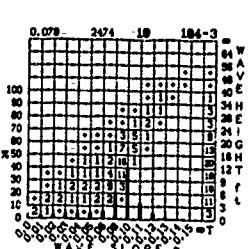
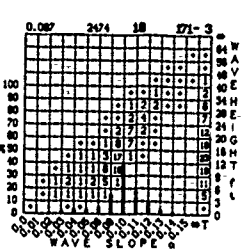
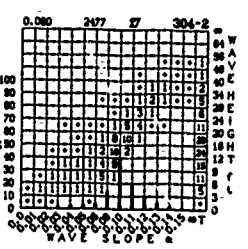
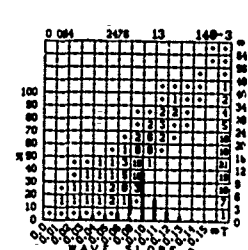
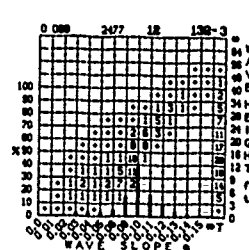
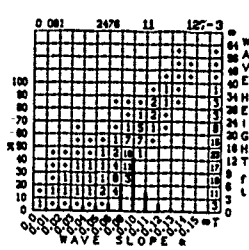
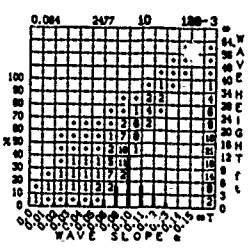
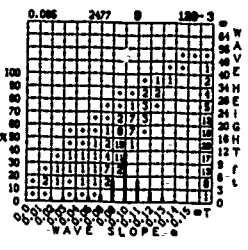
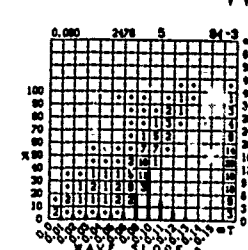
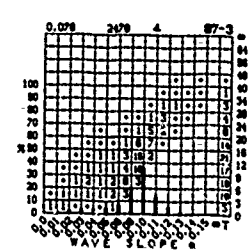
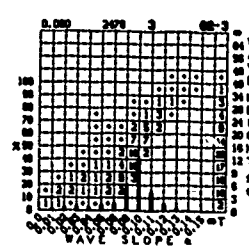
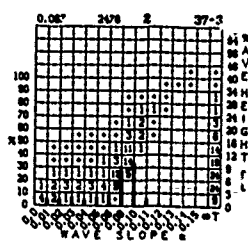
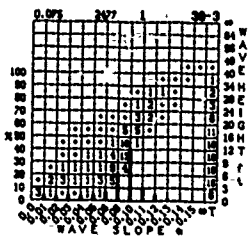
E ( $\alpha$ ) (Cont'd)

FEBRUARY

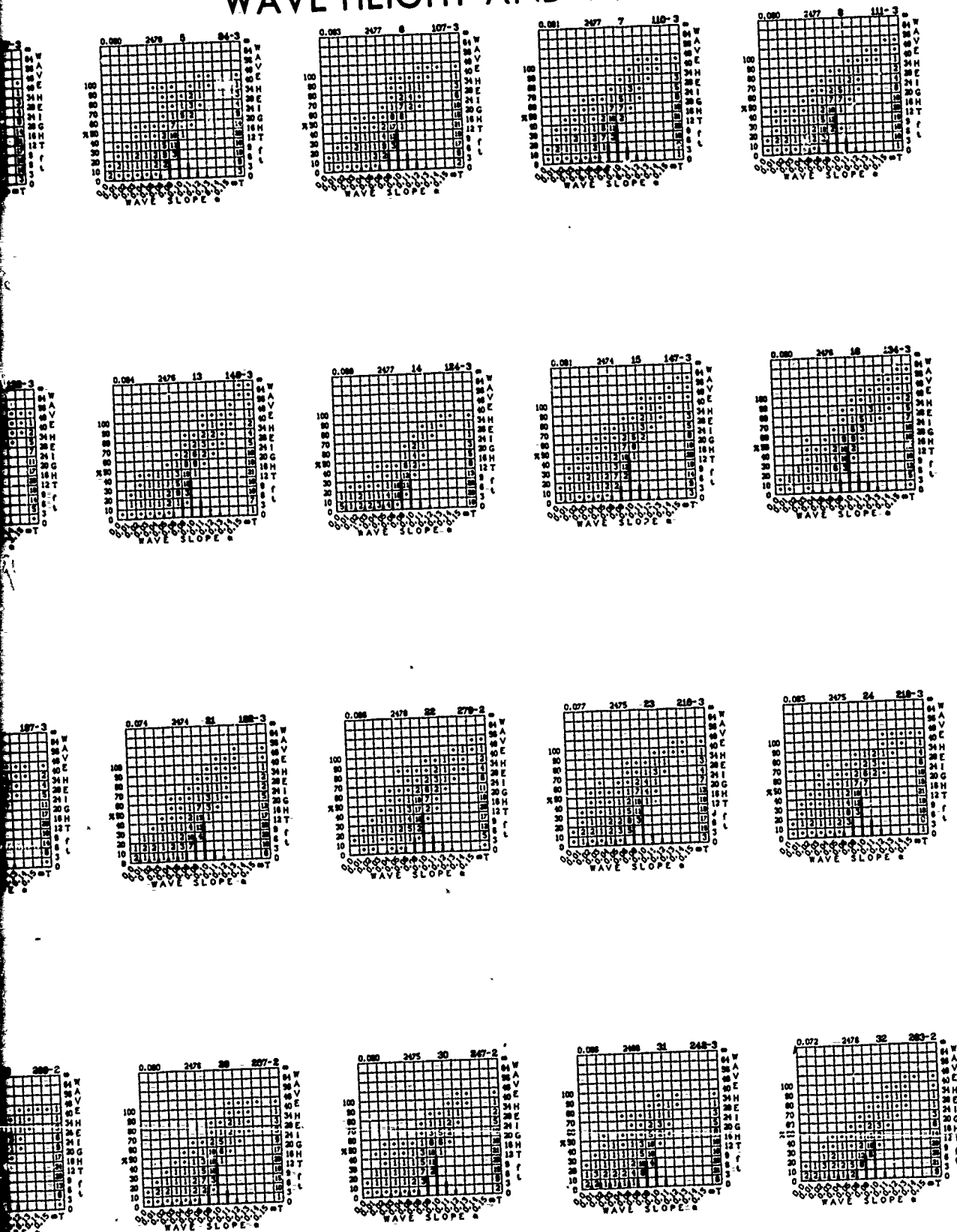


# MARCH

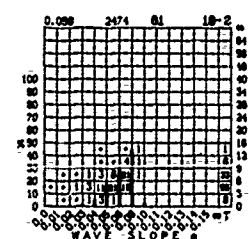
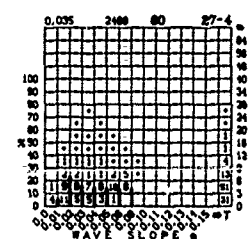
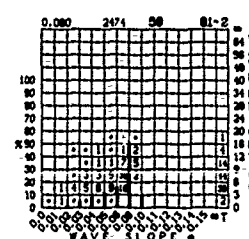
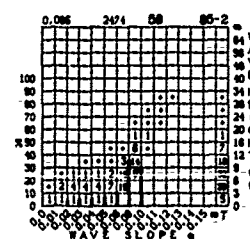
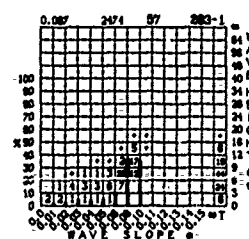
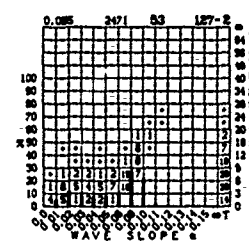
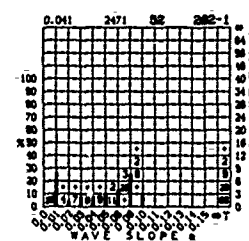
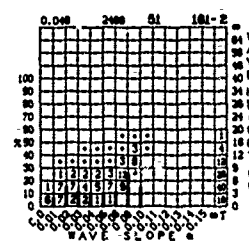
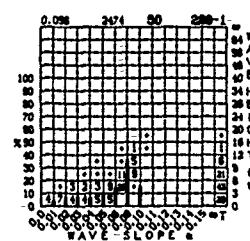
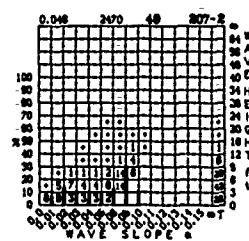
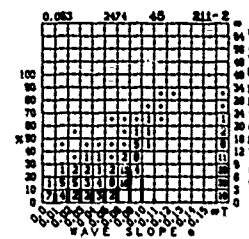
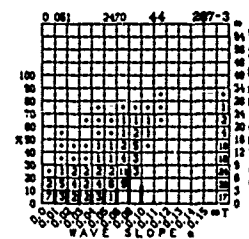
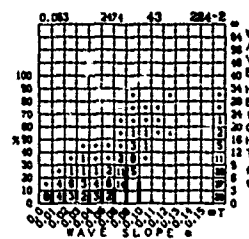
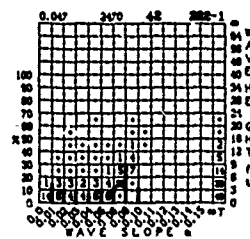
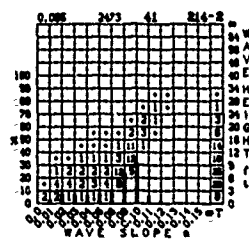
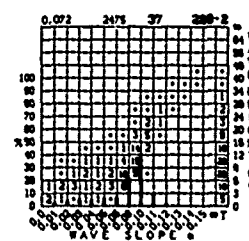
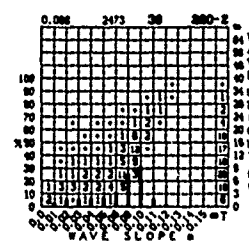
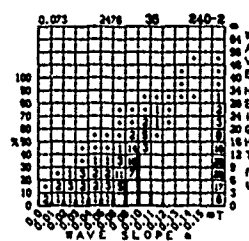
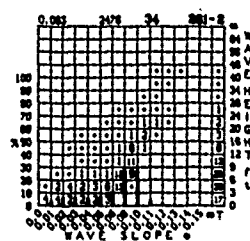
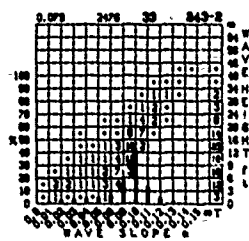
# WAVE



# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )

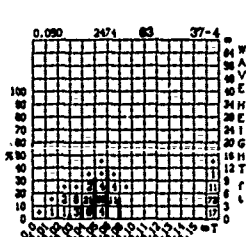
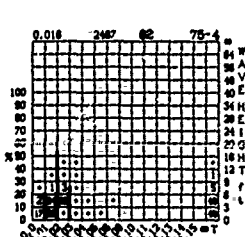
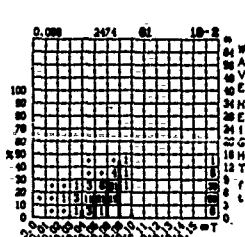
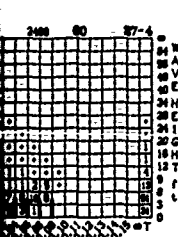
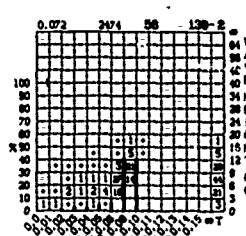
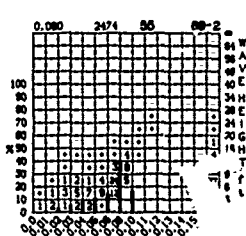
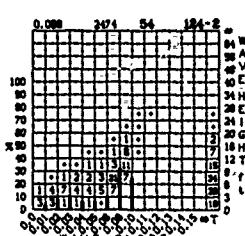
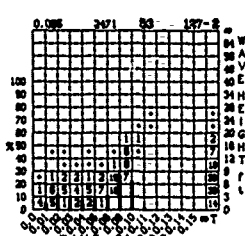
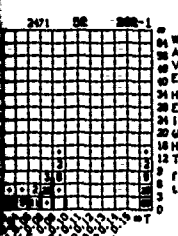
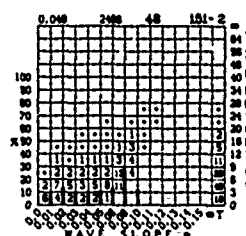
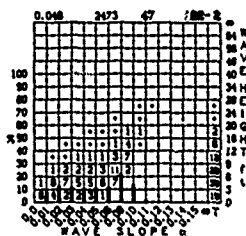
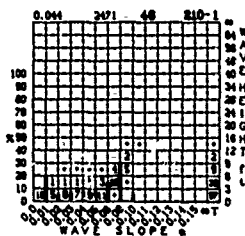
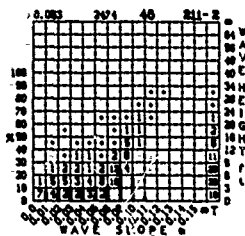
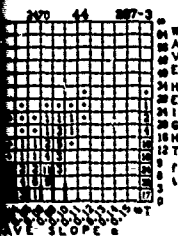
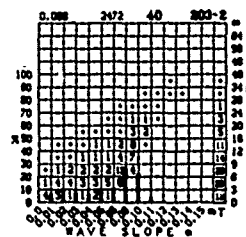
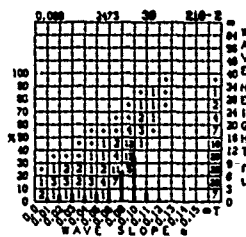
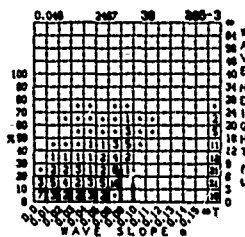
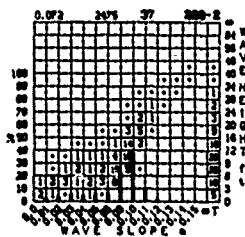
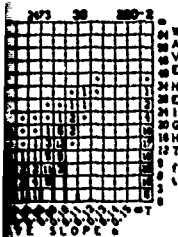


# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



(Cont'd)

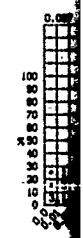
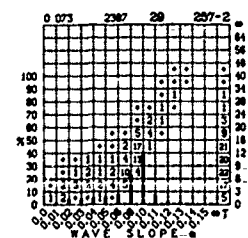
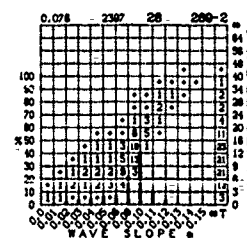
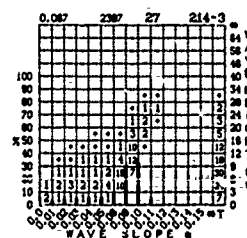
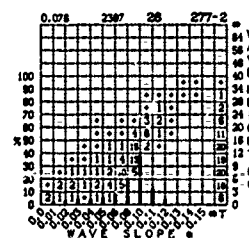
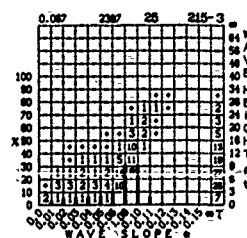
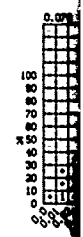
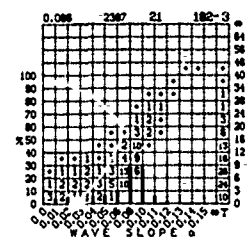
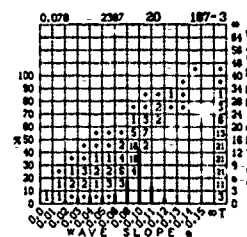
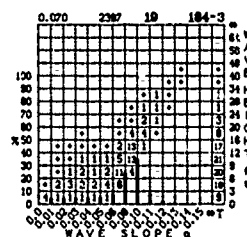
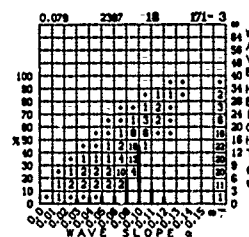
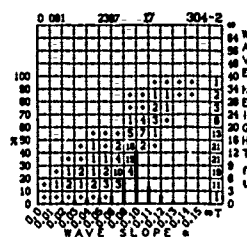
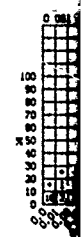
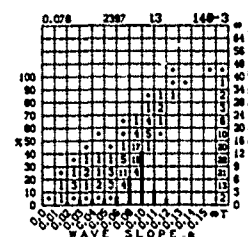
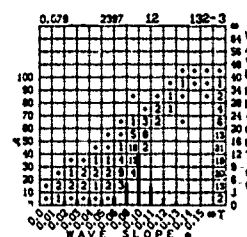
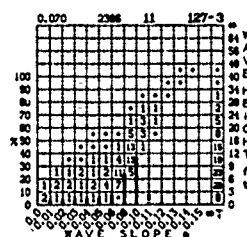
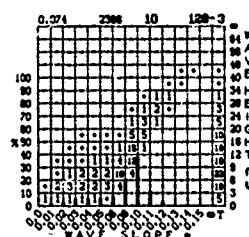
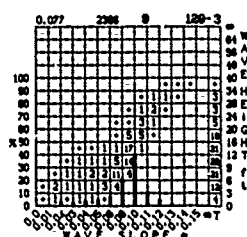
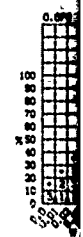
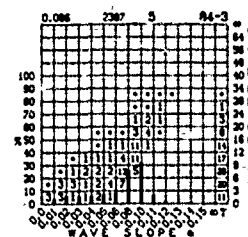
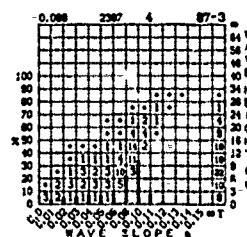
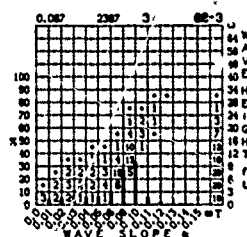
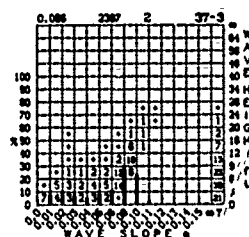
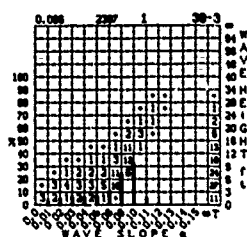
MARCH





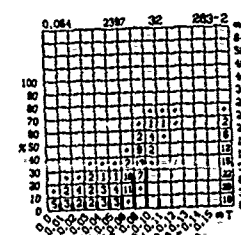
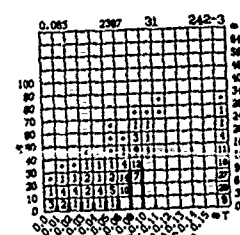
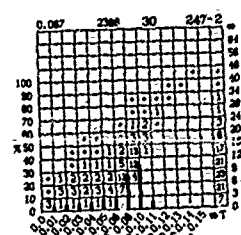
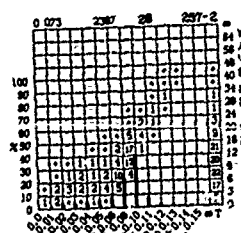
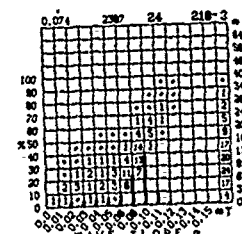
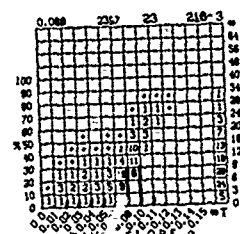
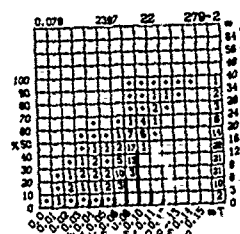
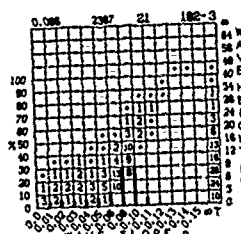
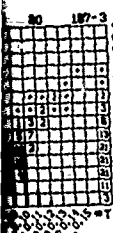
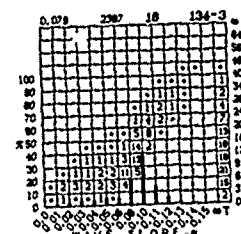
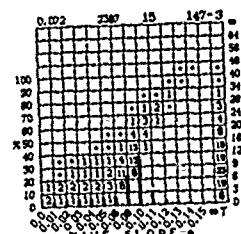
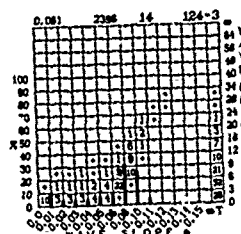
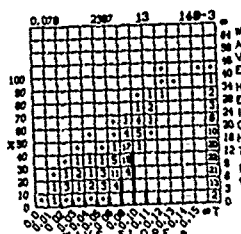
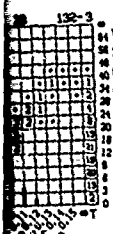
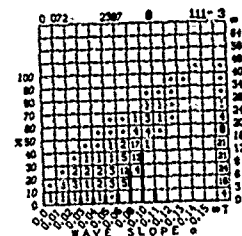
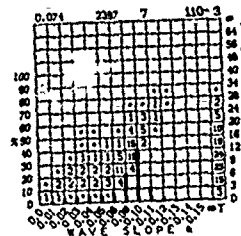
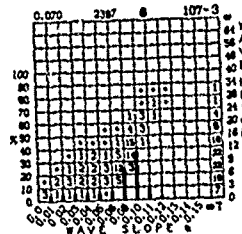
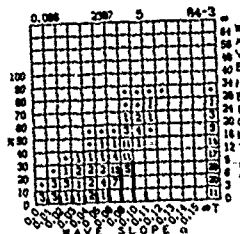
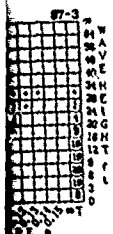
# APRIL

# WAVE

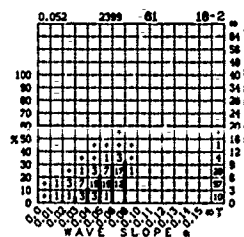
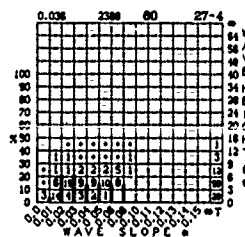
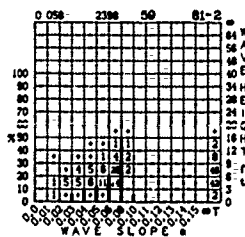
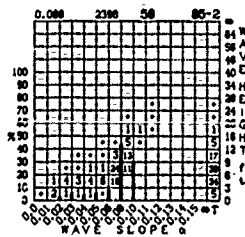
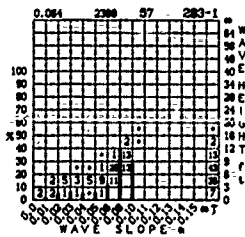
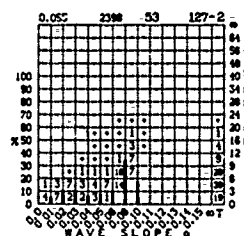
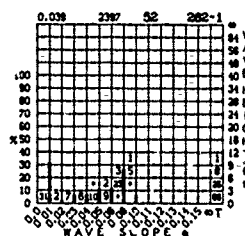
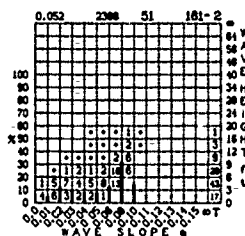
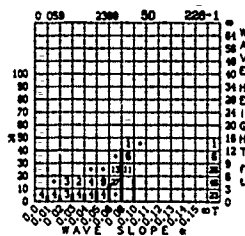
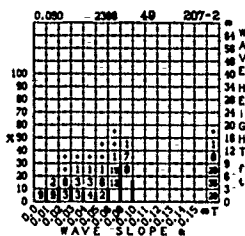
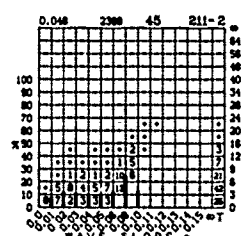
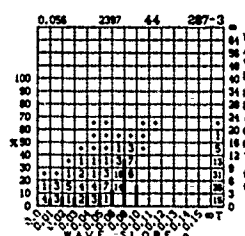
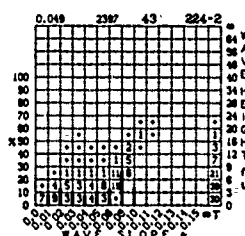
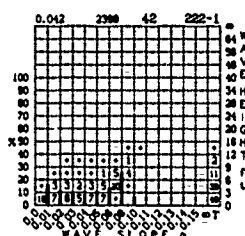
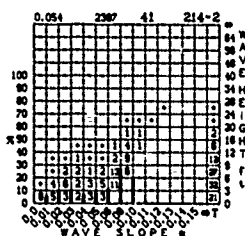
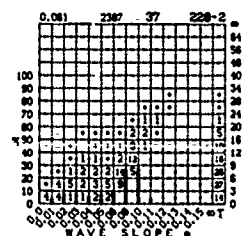
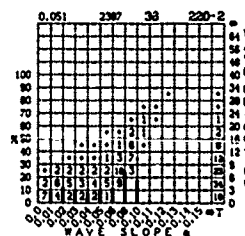
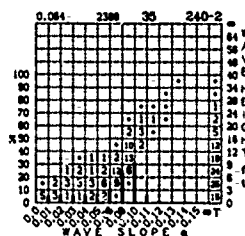
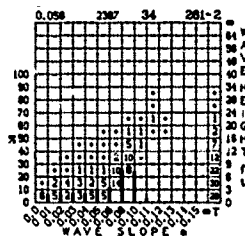
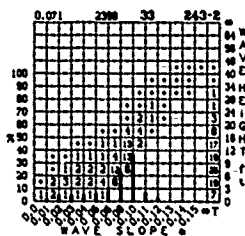




# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )

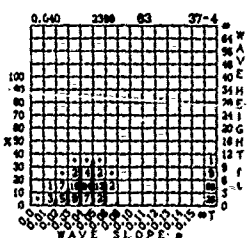
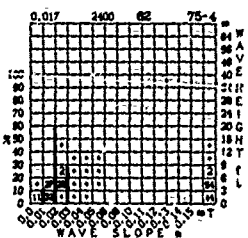
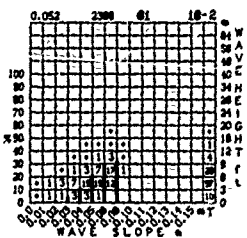
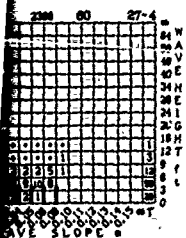
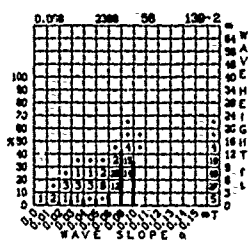
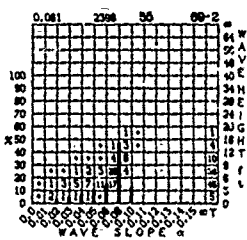
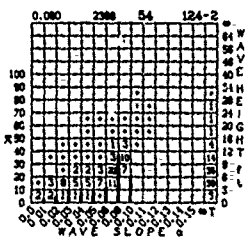
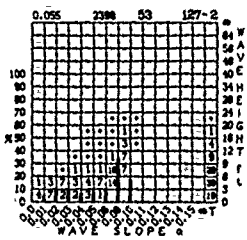
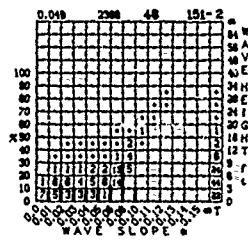
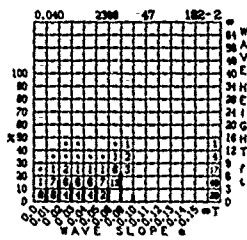
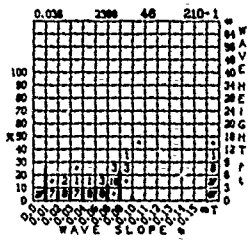
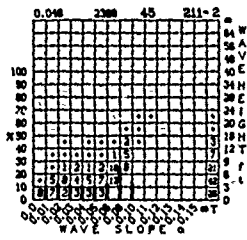
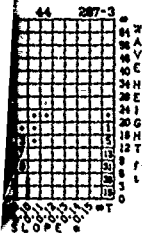
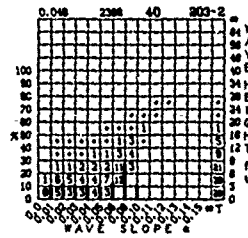
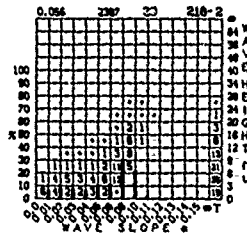
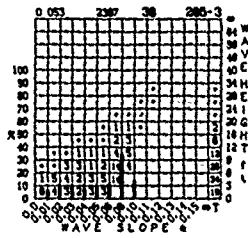
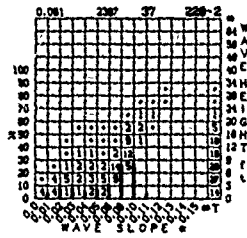


# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



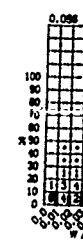
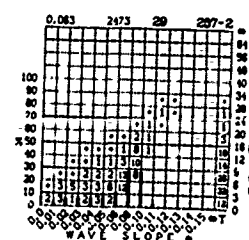
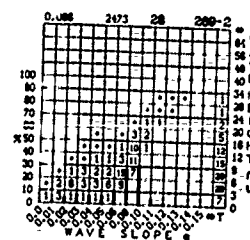
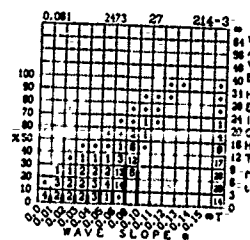
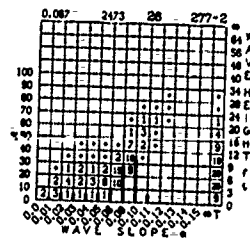
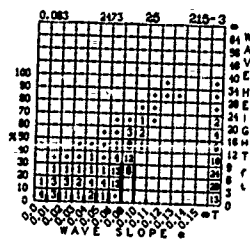
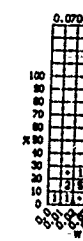
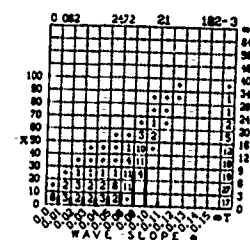
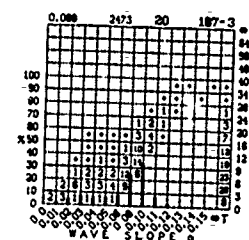
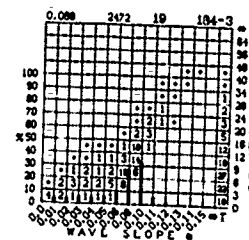
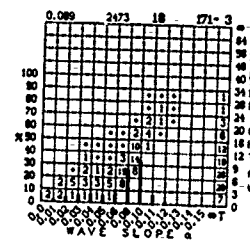
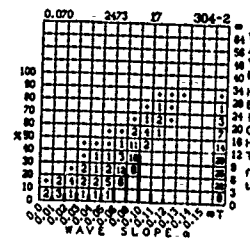
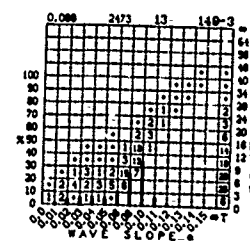
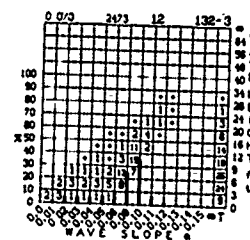
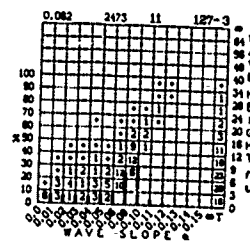
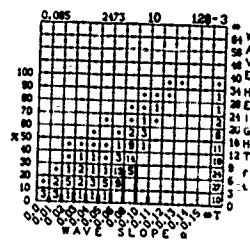
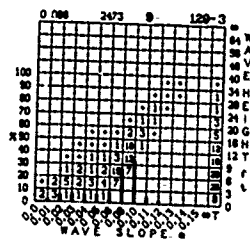
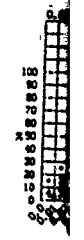
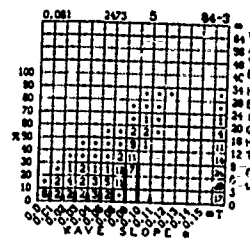
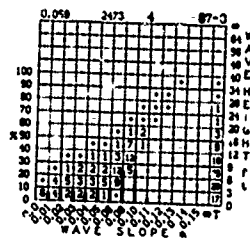
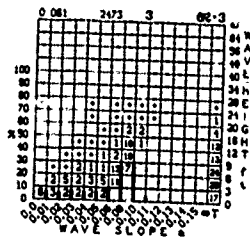
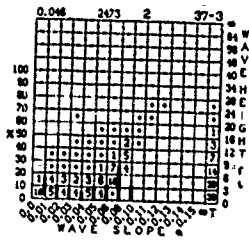
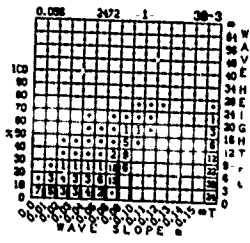
nt'd)

APRIL

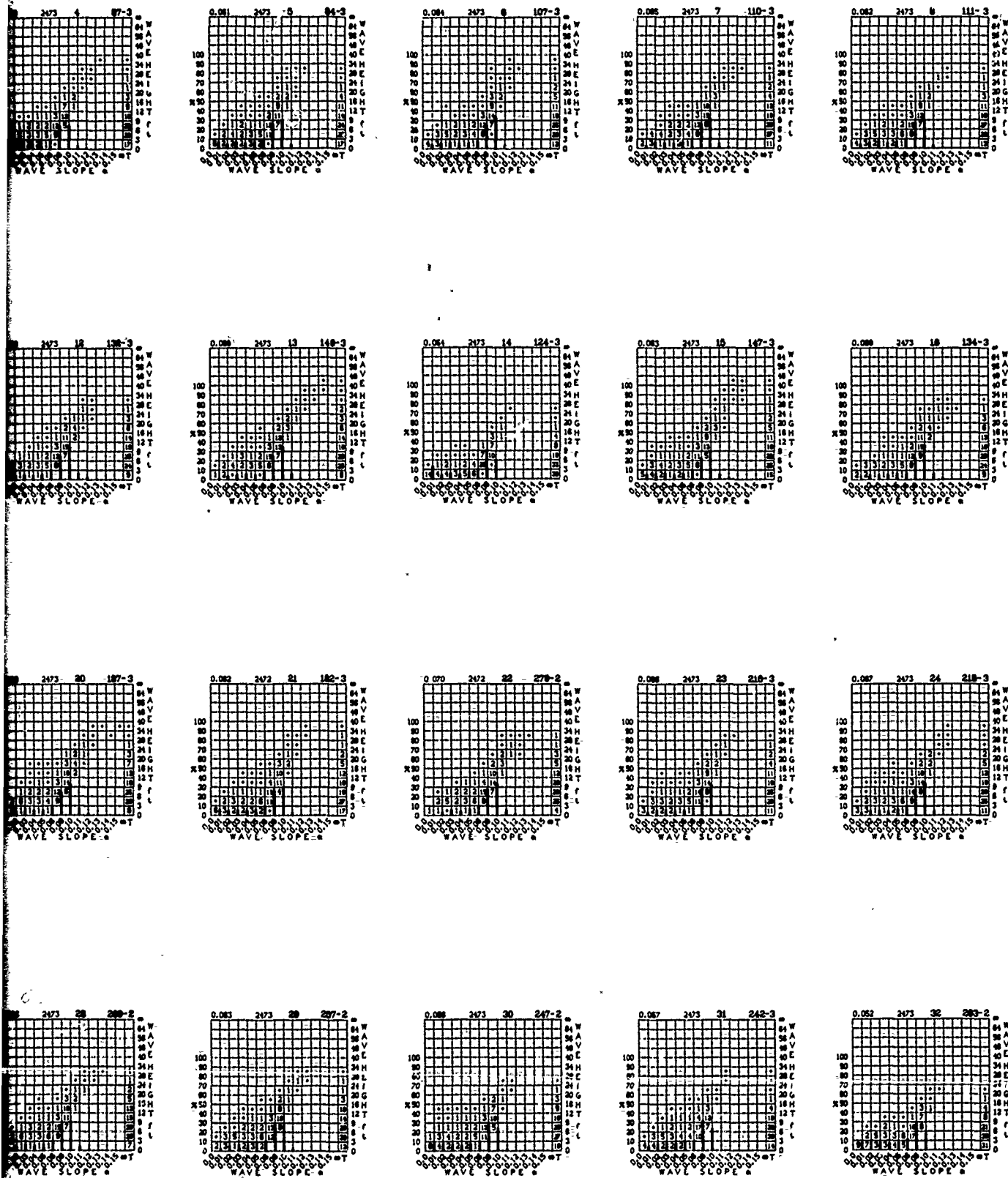


# MAY

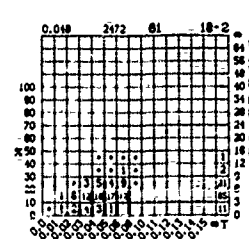
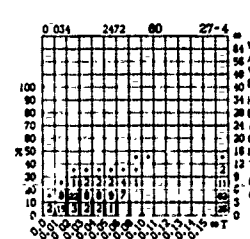
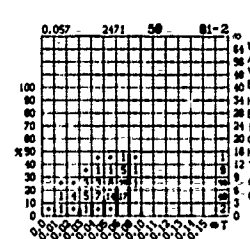
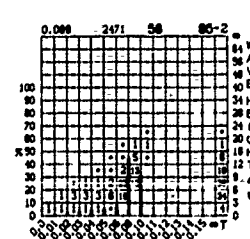
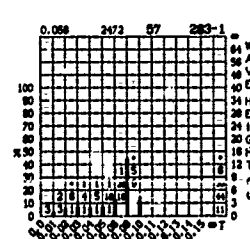
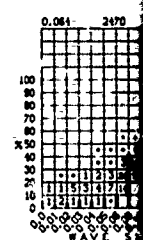
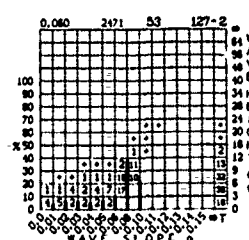
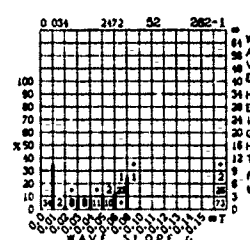
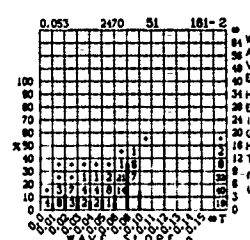
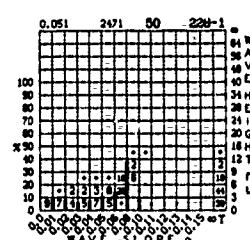
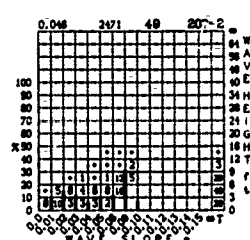
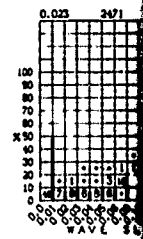
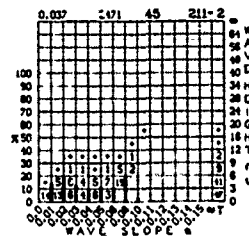
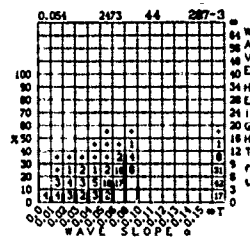
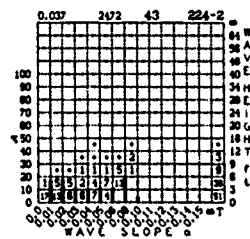
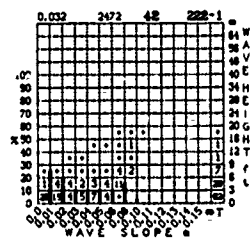
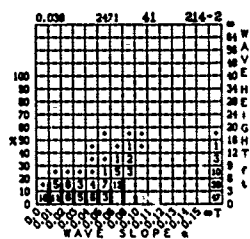
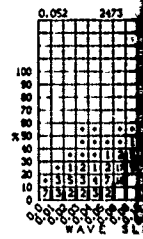
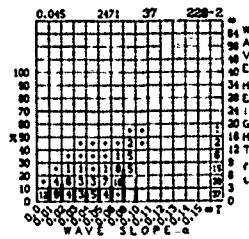
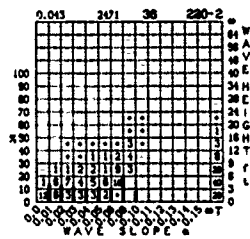
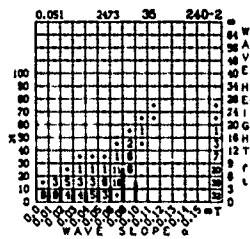
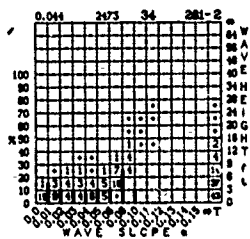
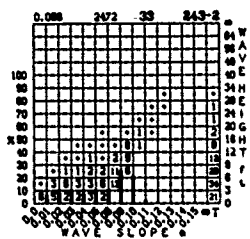
# WAVE



# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )

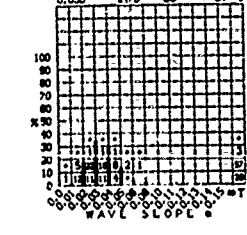
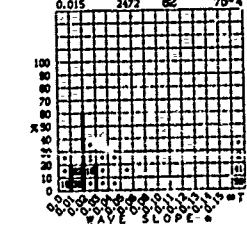
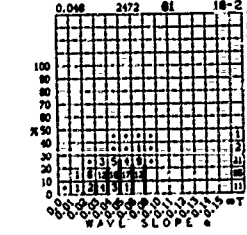
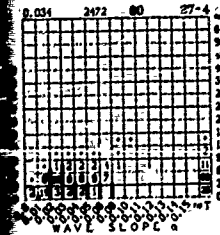
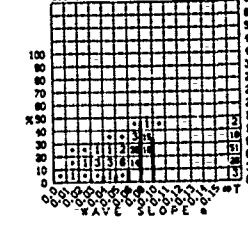
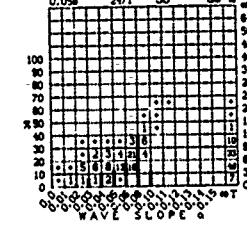
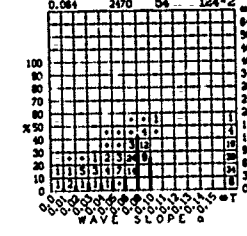
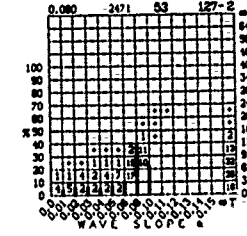
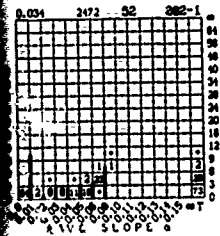
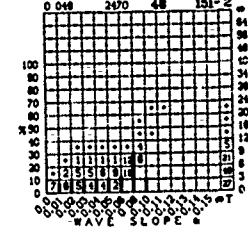
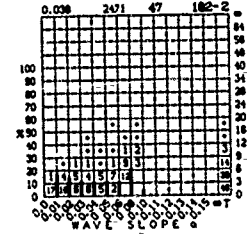
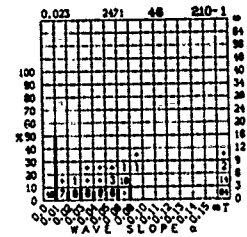
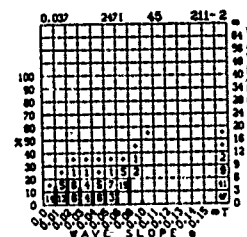
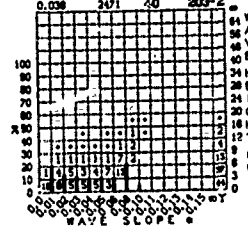
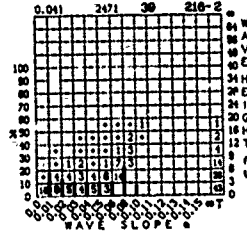
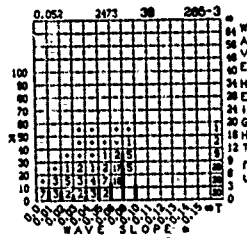
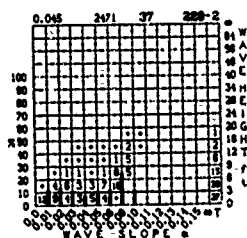
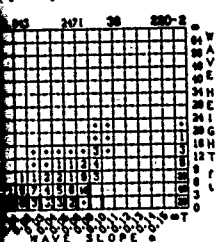


# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



) (Cont'd)

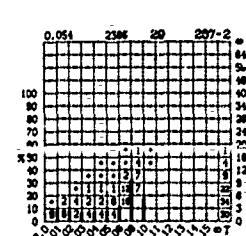
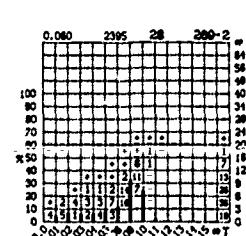
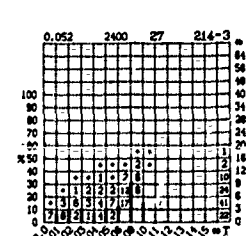
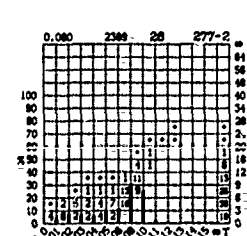
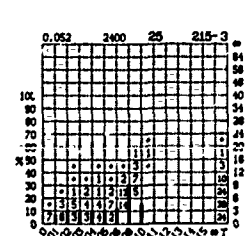
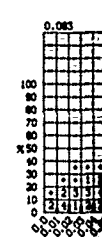
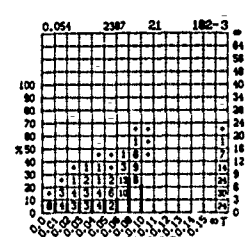
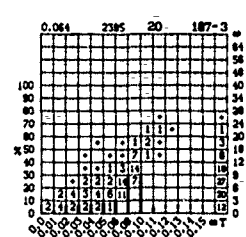
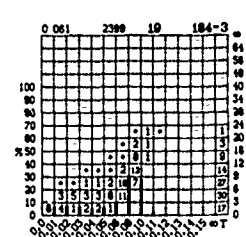
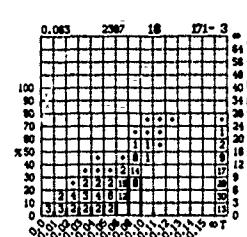
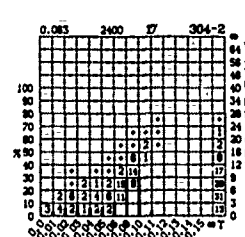
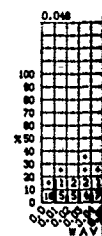
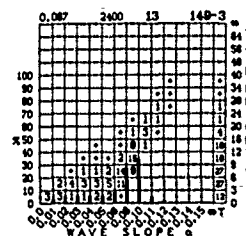
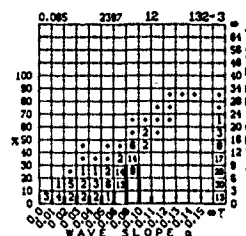
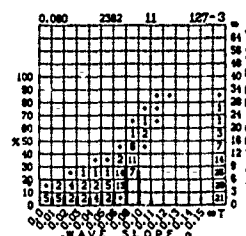
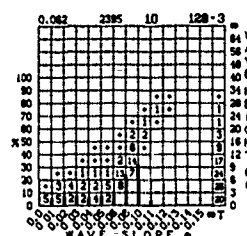
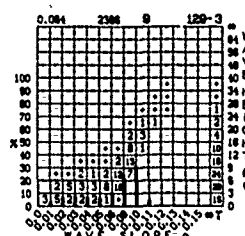
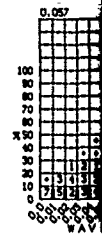
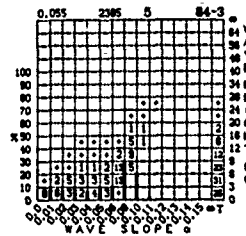
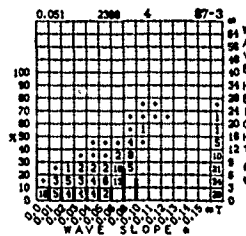
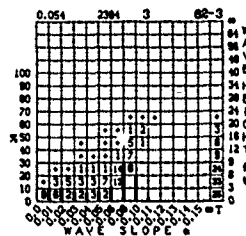
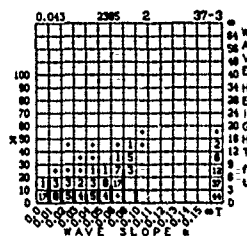
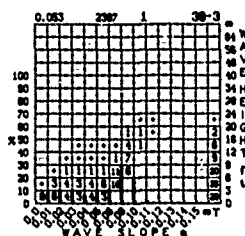
MAY





# JUNE

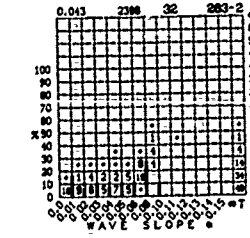
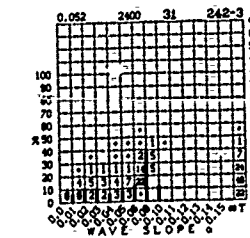
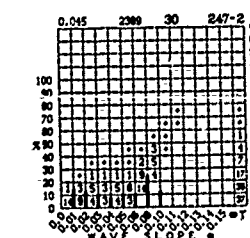
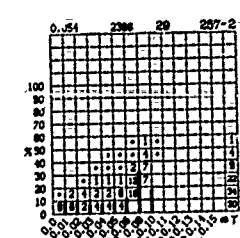
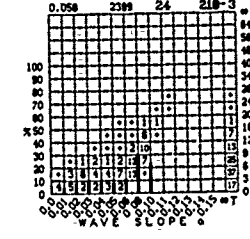
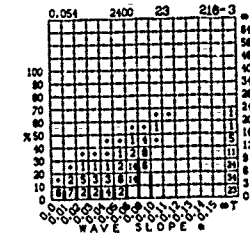
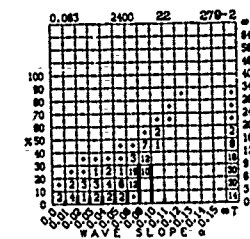
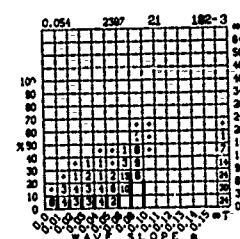
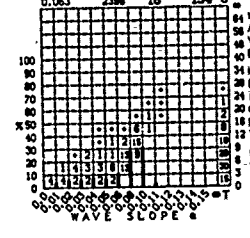
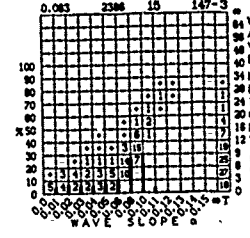
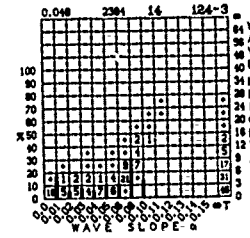
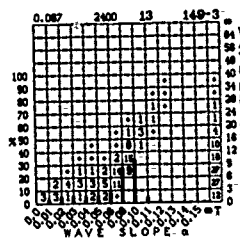
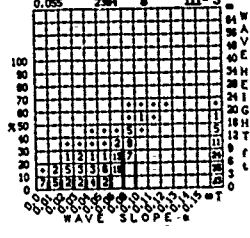
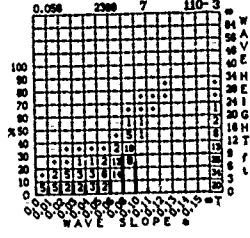
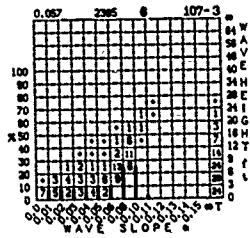
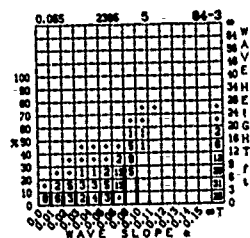
# WAVE H



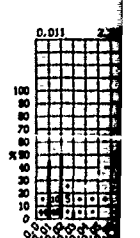
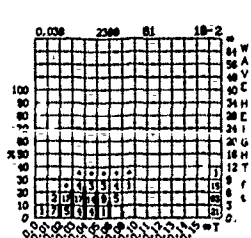
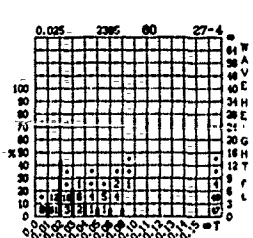
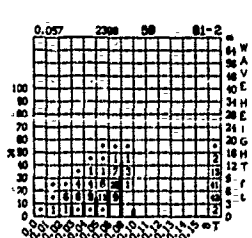
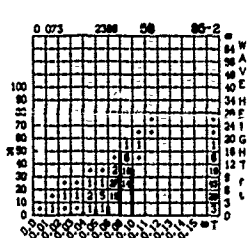
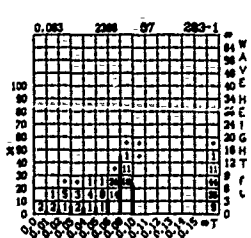
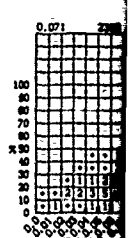
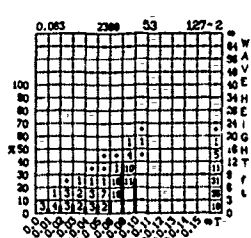
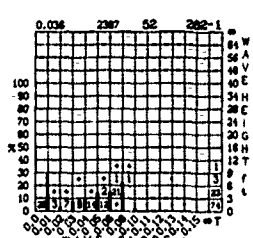
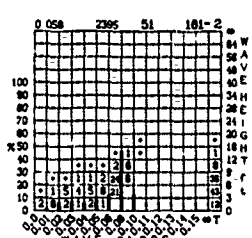
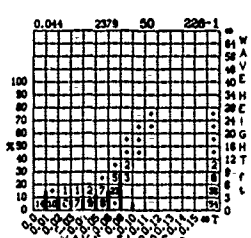
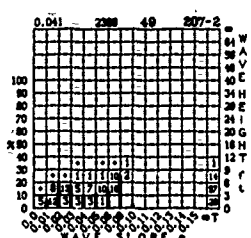
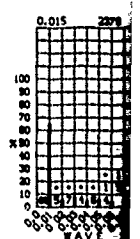
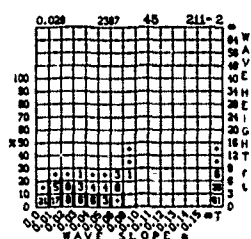
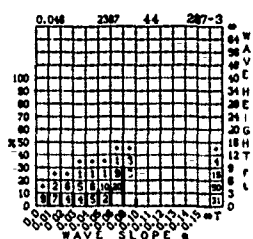
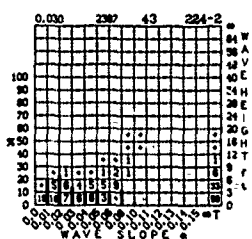
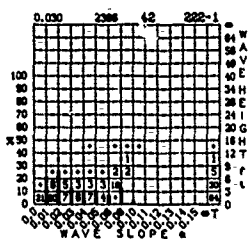
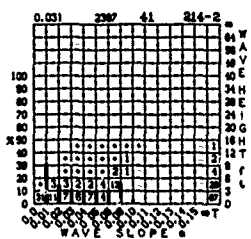
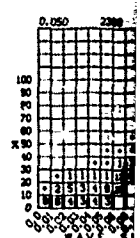
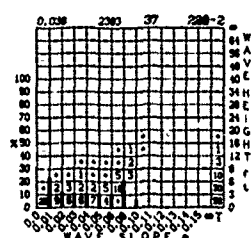
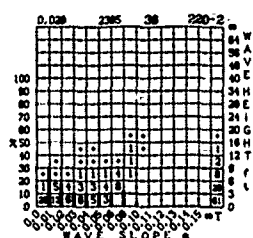
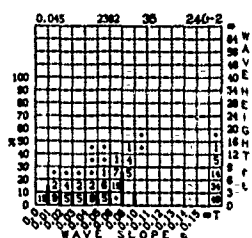
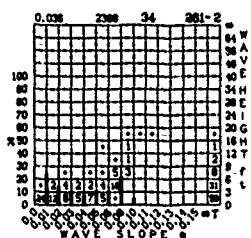
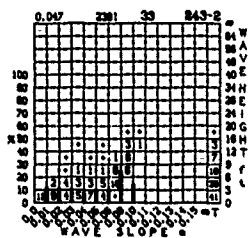
①



# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )

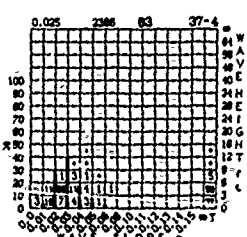
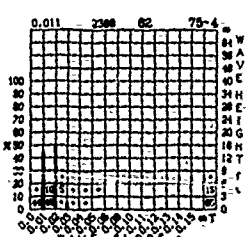
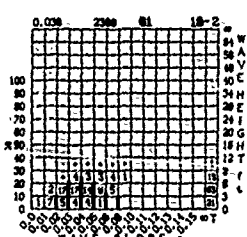
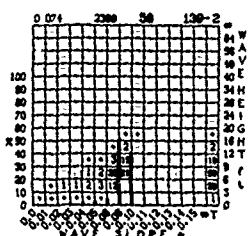
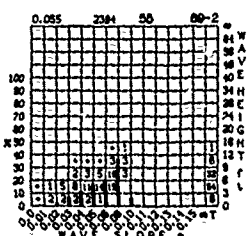
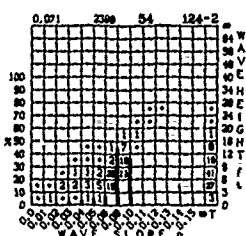
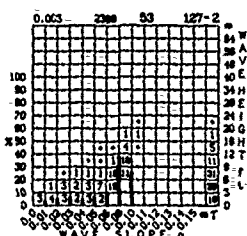
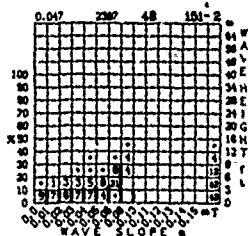
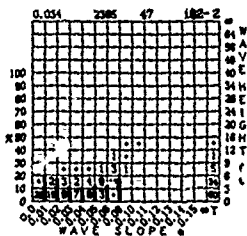
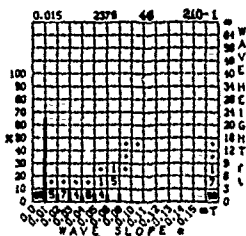
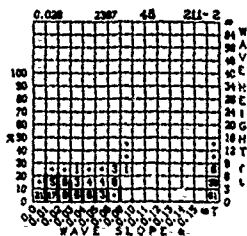
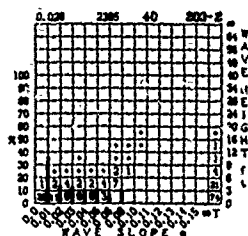
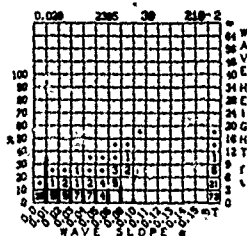
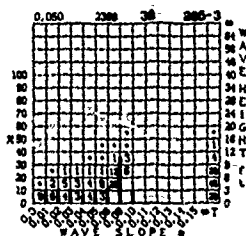
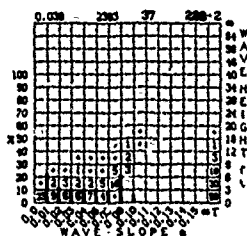


# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



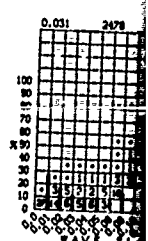
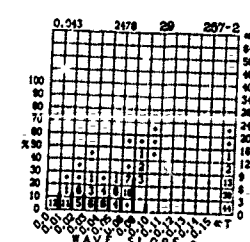
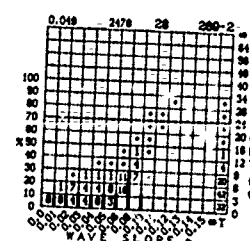
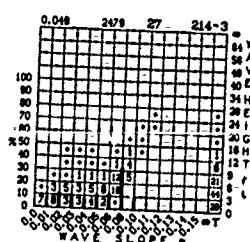
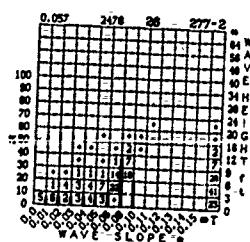
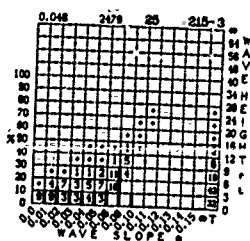
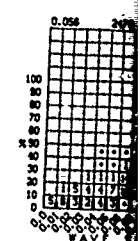
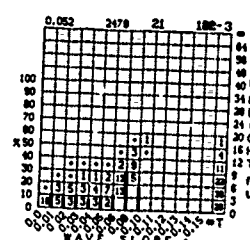
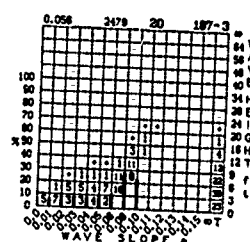
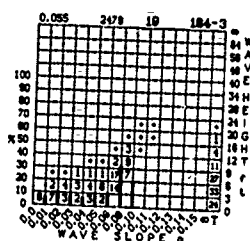
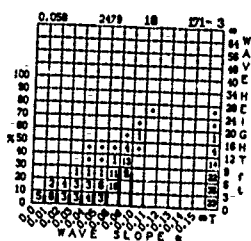
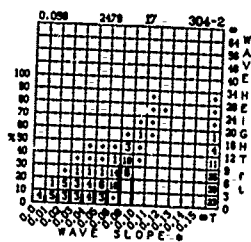
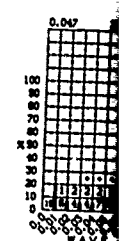
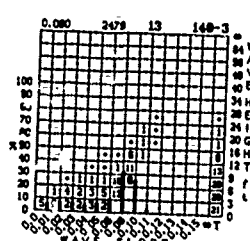
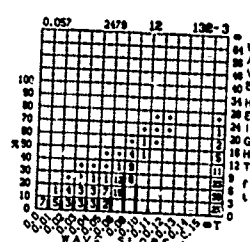
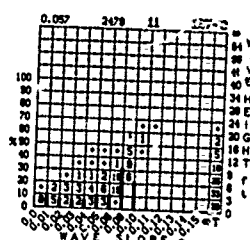
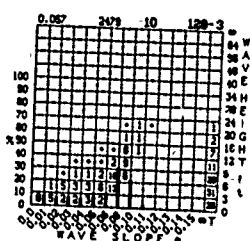
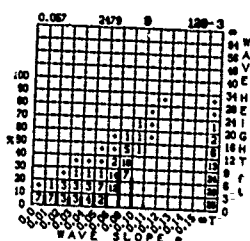
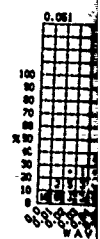
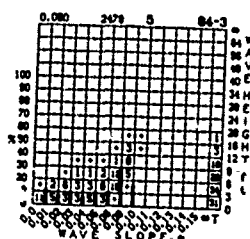
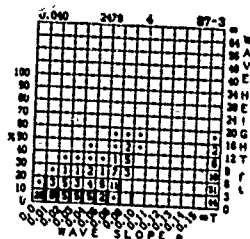
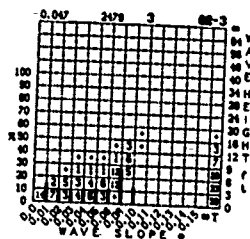
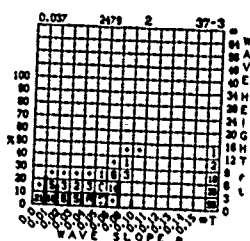
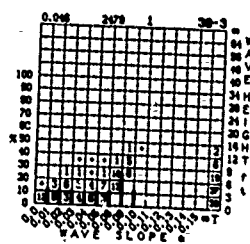
# JUNE

b)

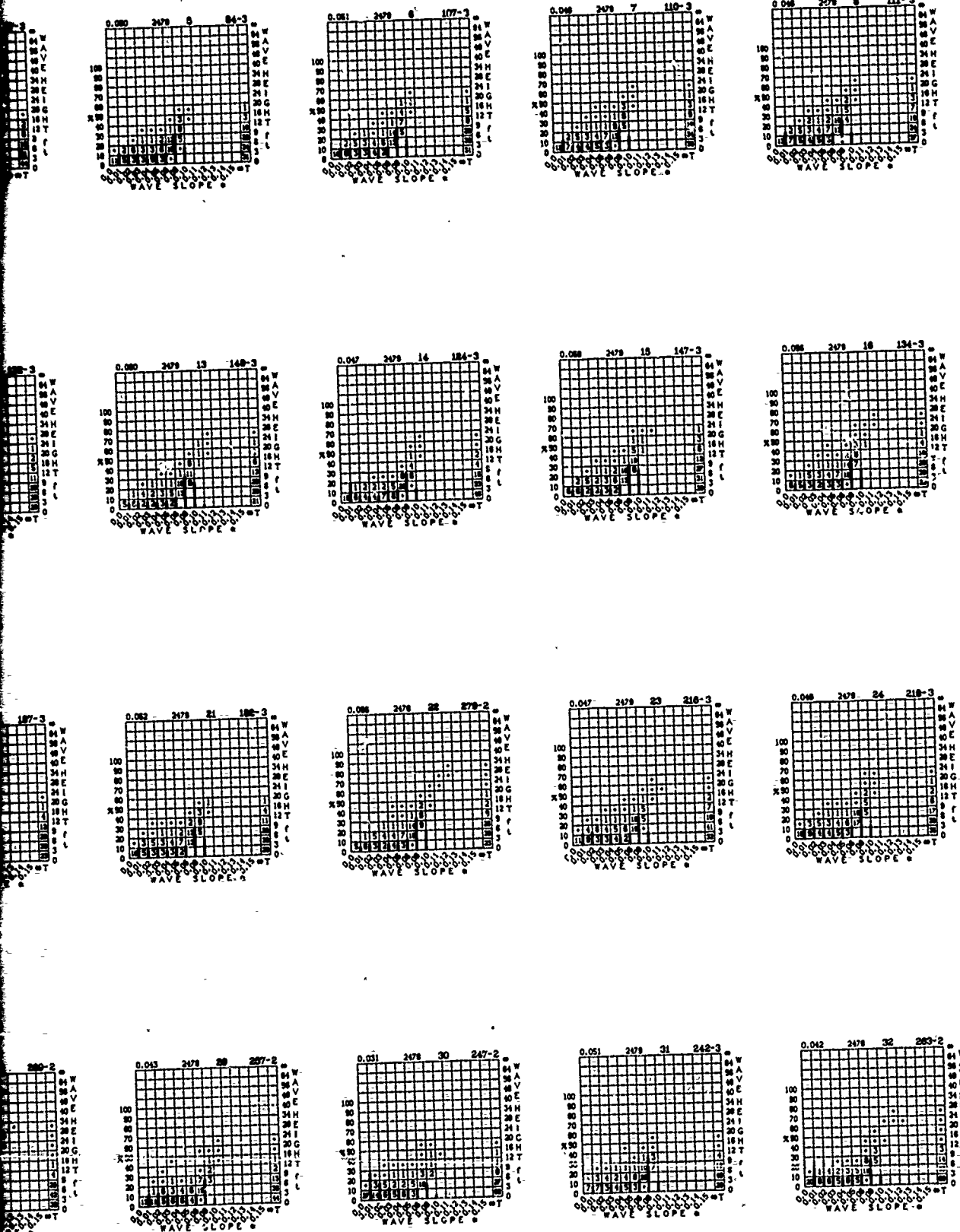


# JULY

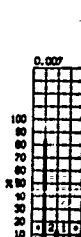
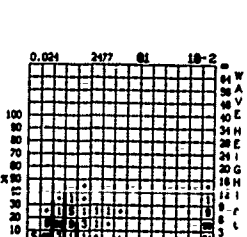
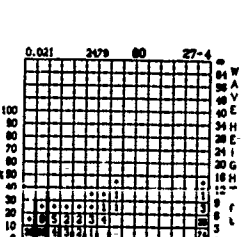
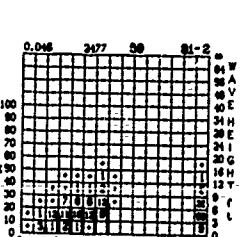
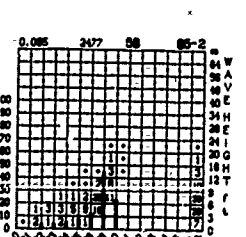
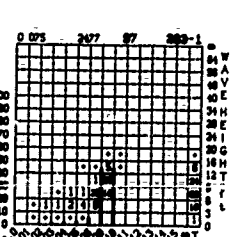
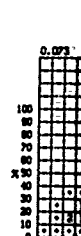
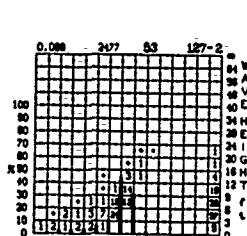
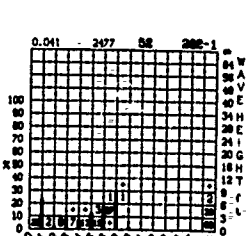
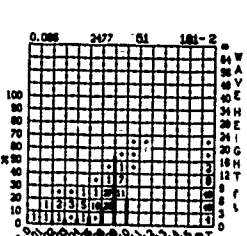
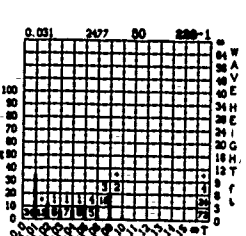
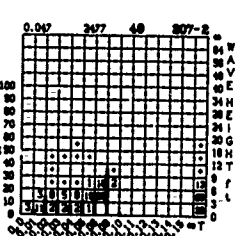
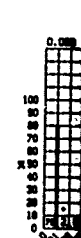
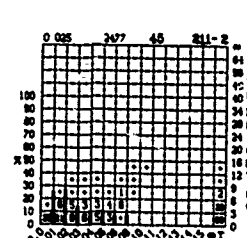
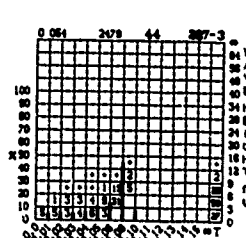
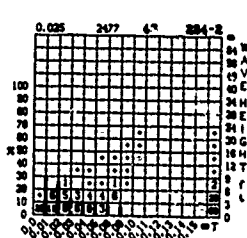
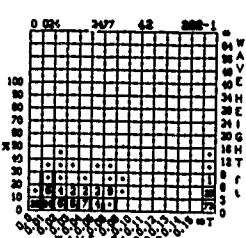
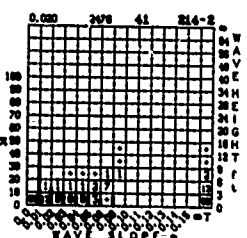
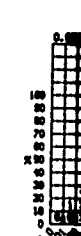
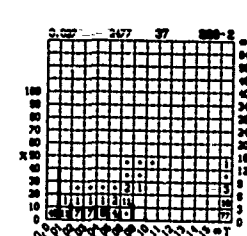
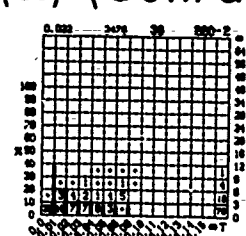
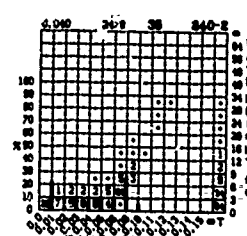
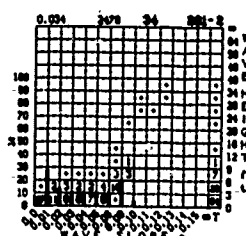
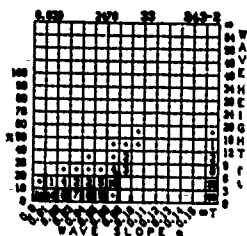
# WAVE H



# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )

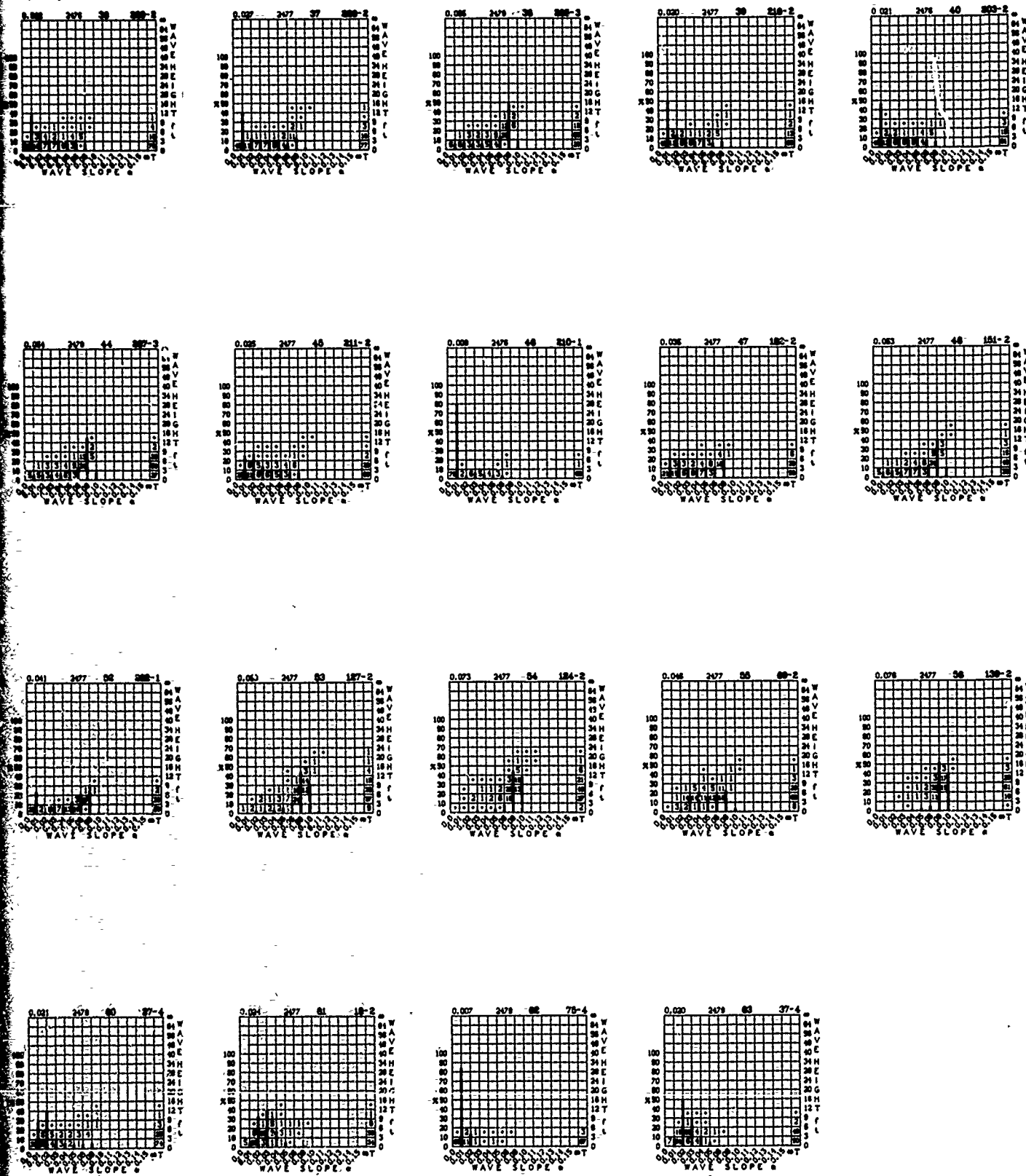


# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



$\alpha$ ) (Cont'd)

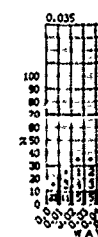
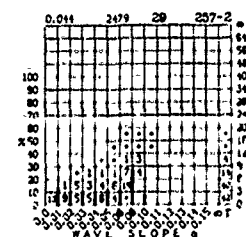
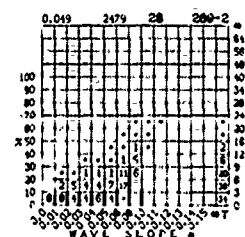
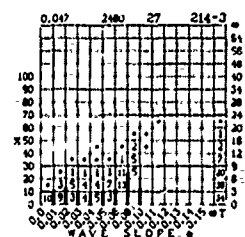
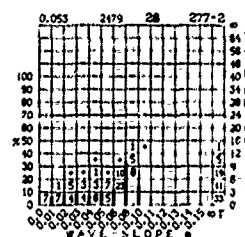
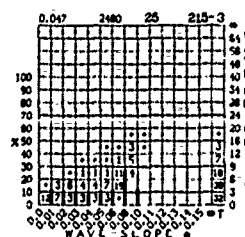
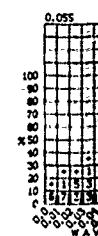
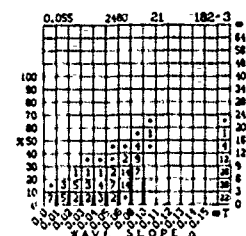
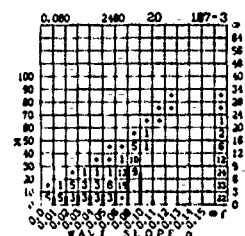
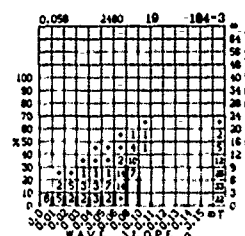
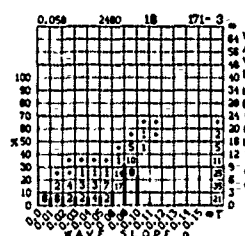
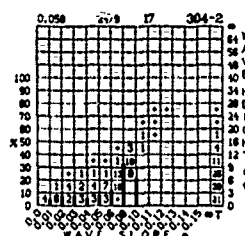
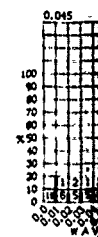
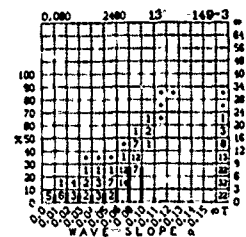
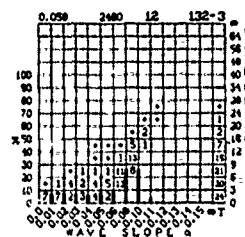
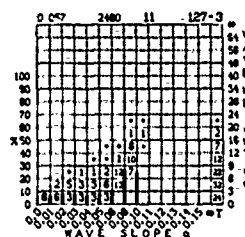
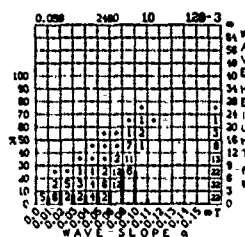
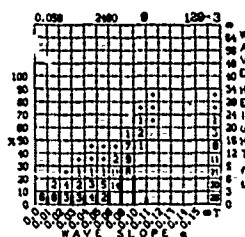
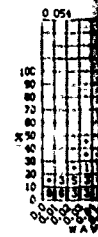
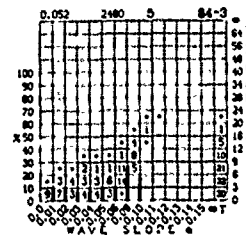
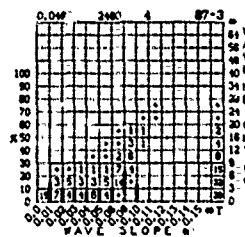
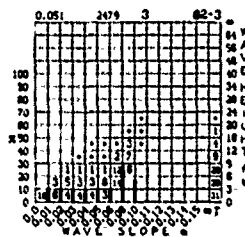
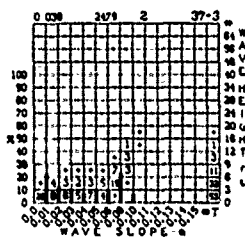
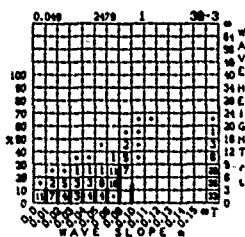
JULY





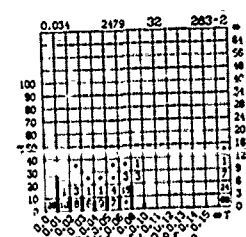
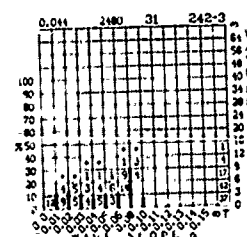
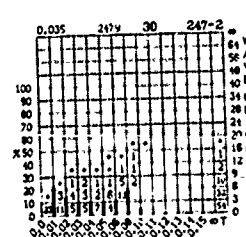
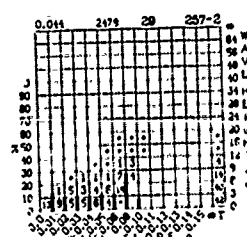
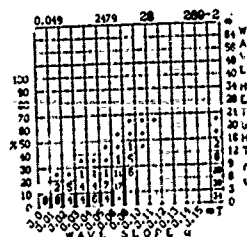
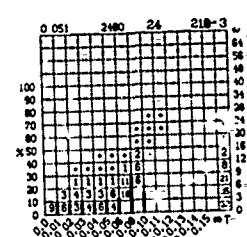
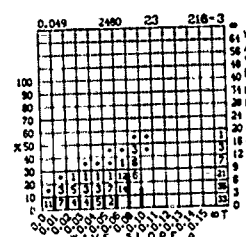
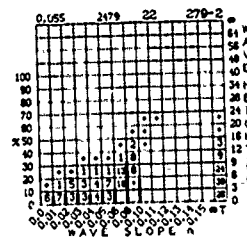
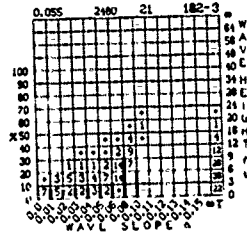
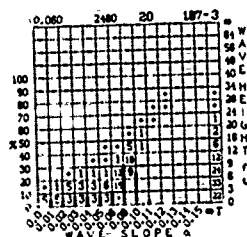
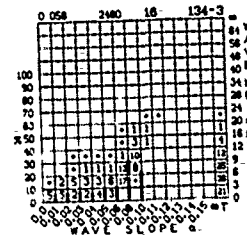
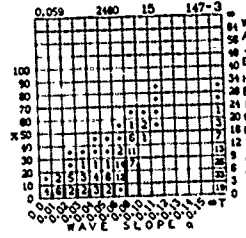
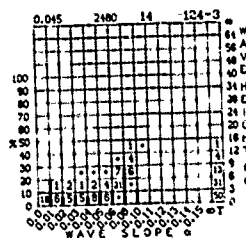
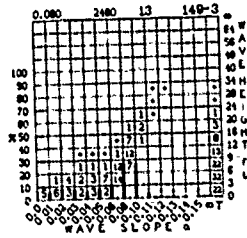
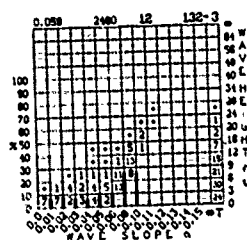
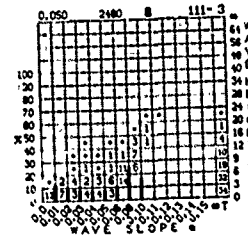
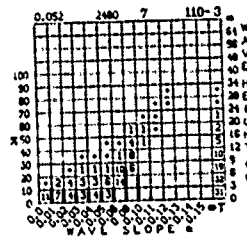
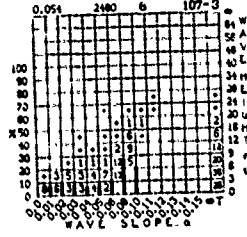
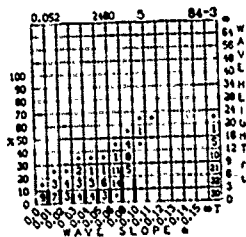
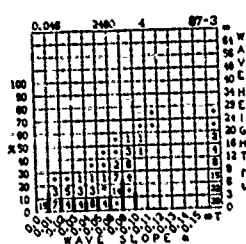
# AUGUST

# WAVE H

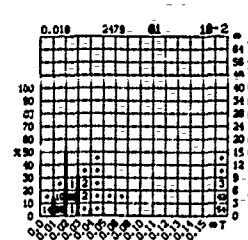
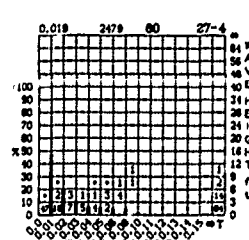
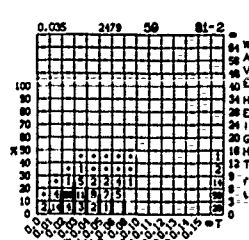
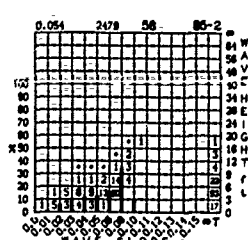
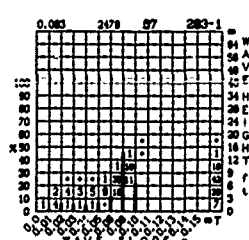
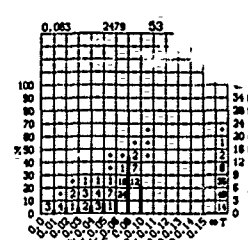
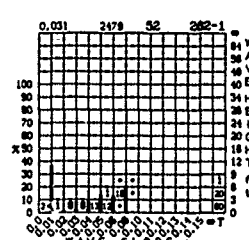
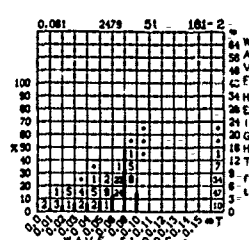
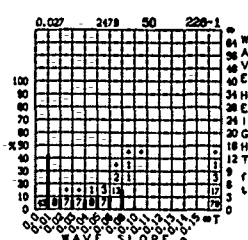
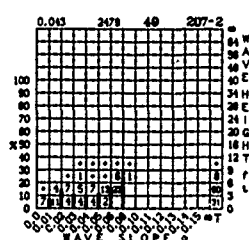
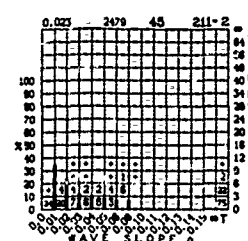
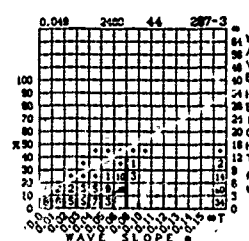
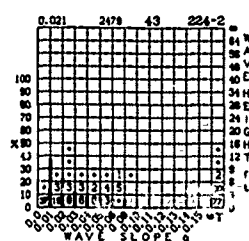
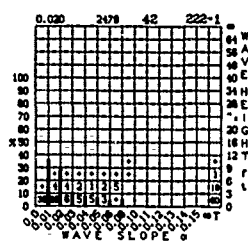
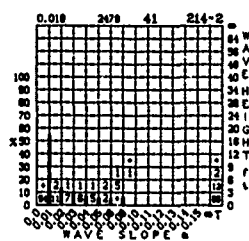
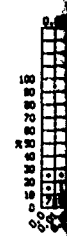
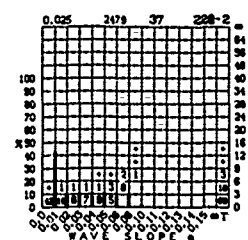
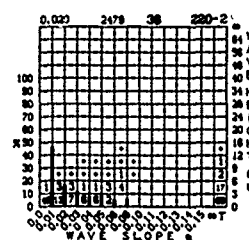
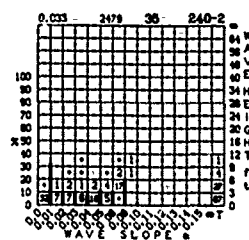
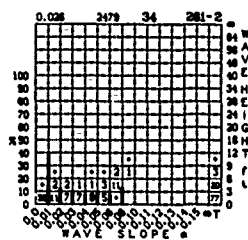
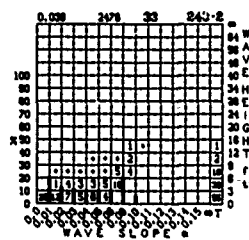




# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )

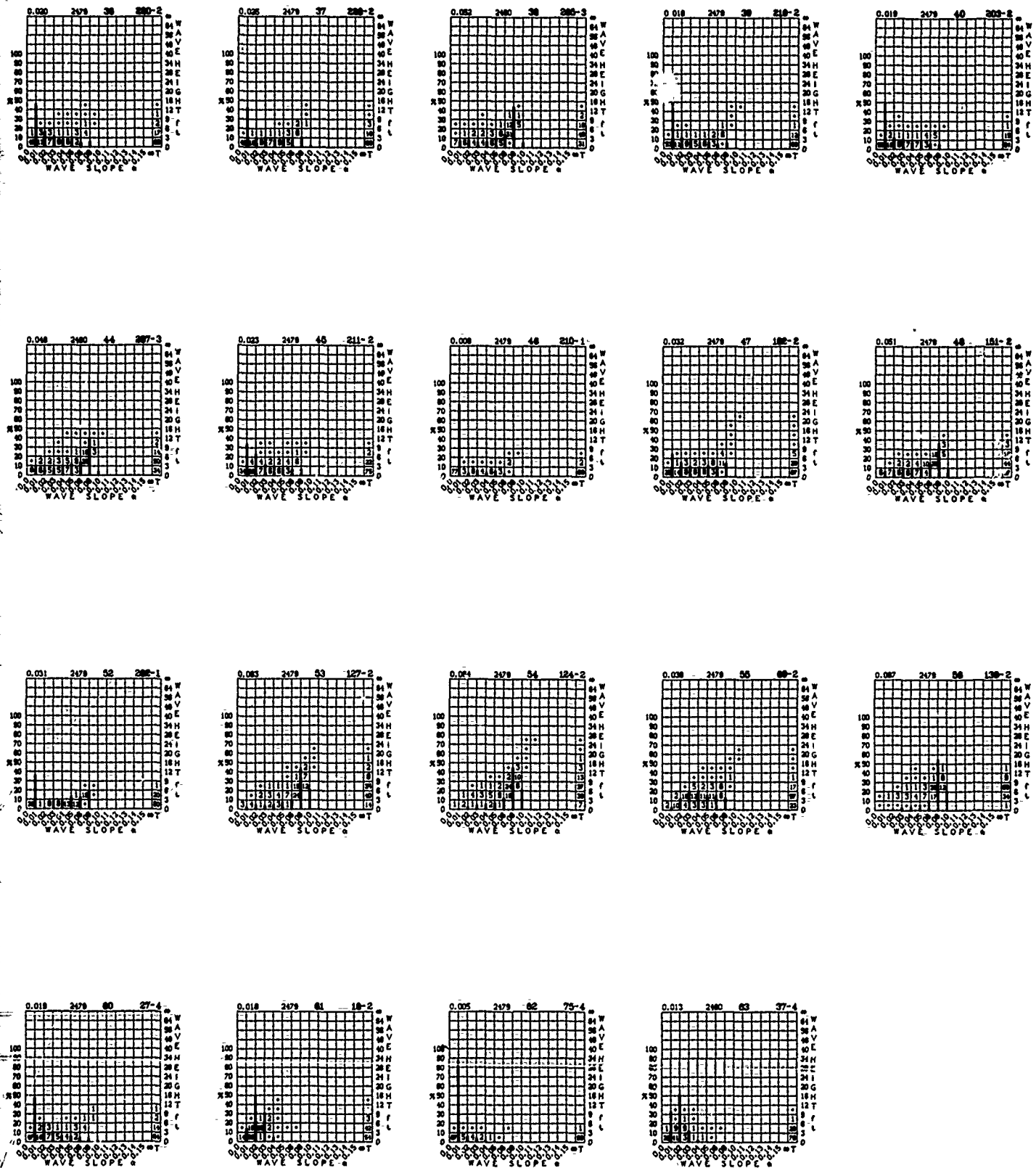


# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



(α) (Cont'd)

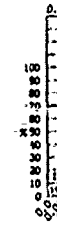
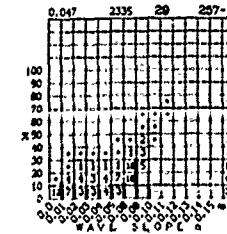
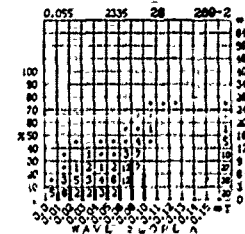
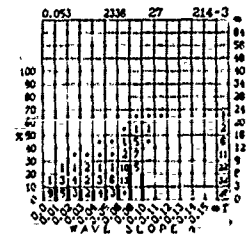
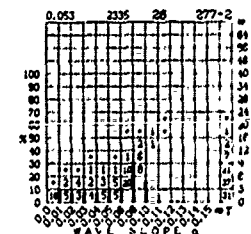
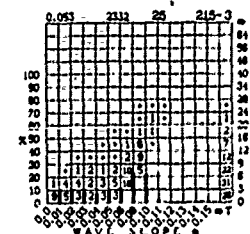
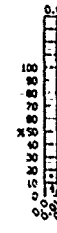
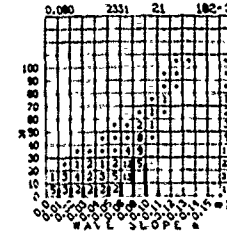
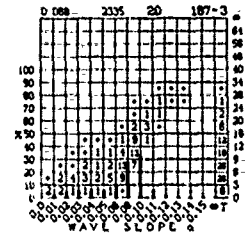
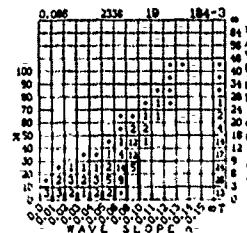
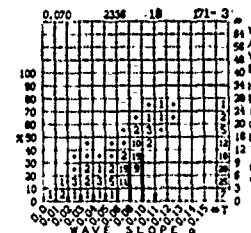
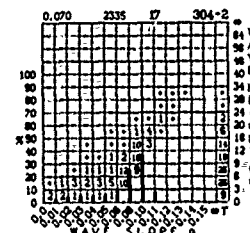
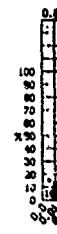
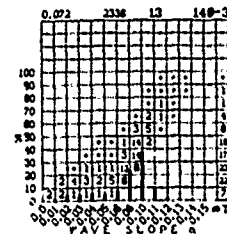
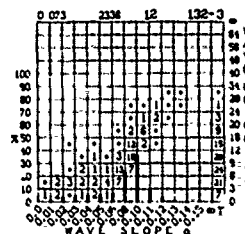
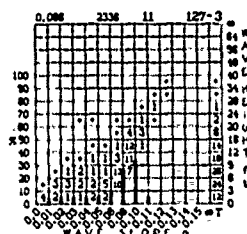
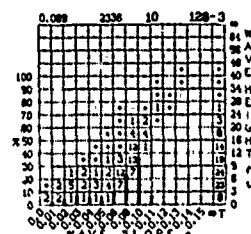
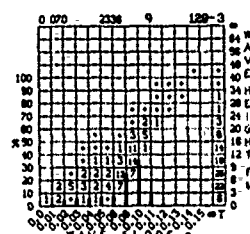
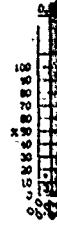
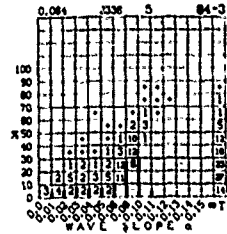
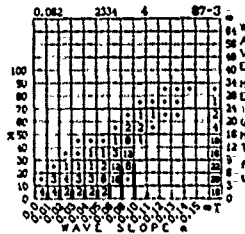
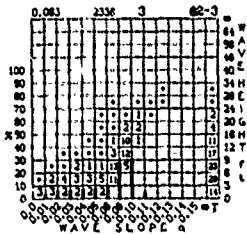
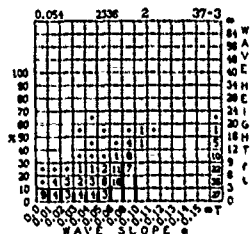
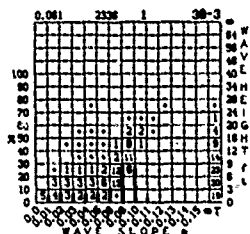
AUGUST



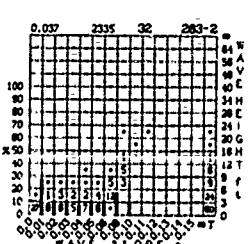
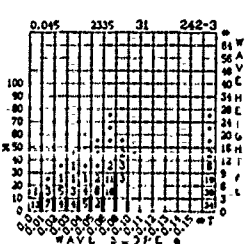
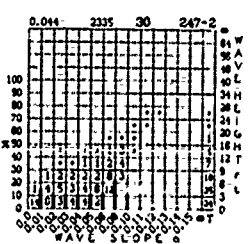
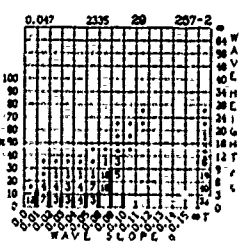
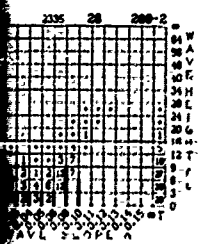
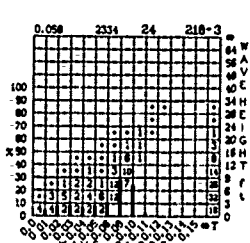
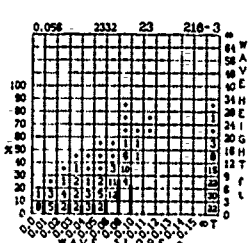
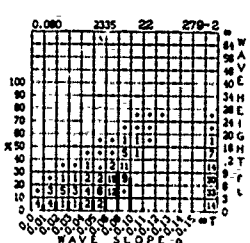
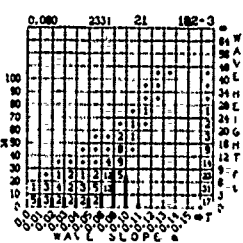
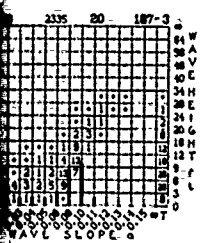
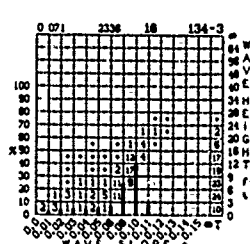
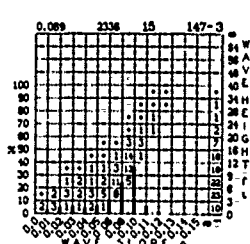
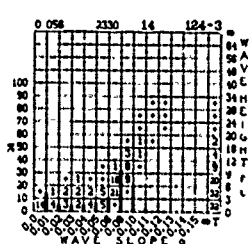
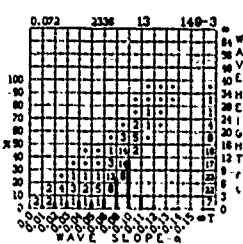
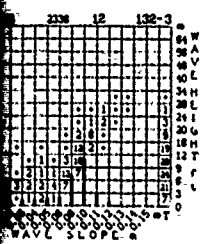
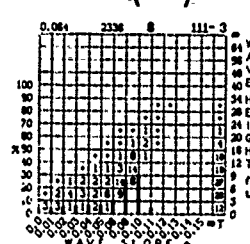
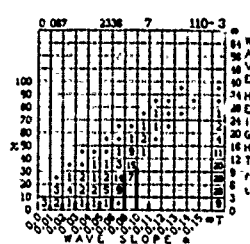
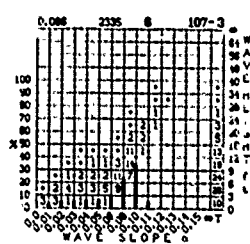
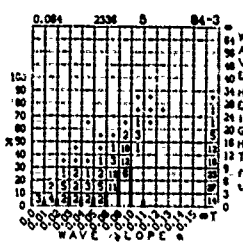
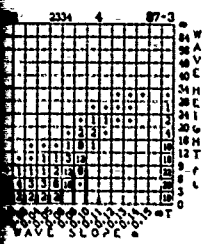
(2)

# SEPTEMBER

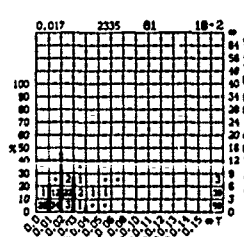
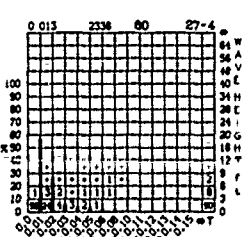
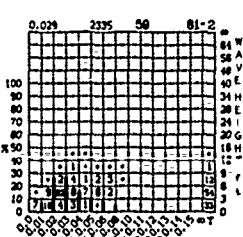
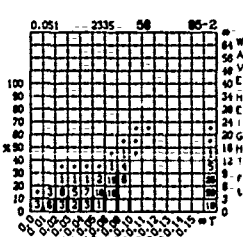
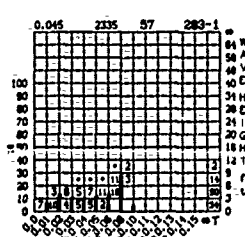
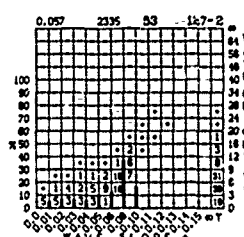
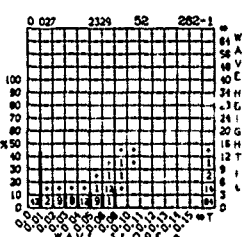
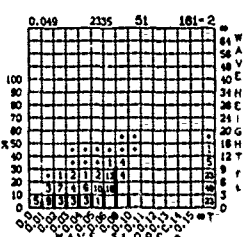
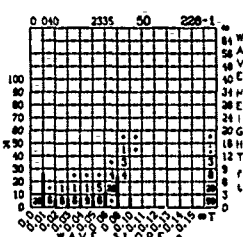
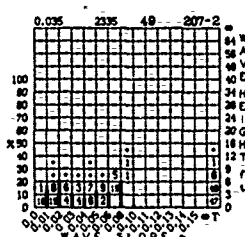
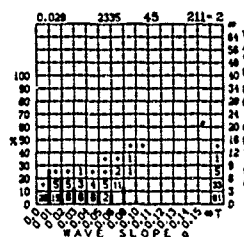
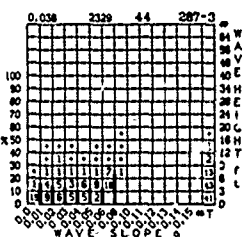
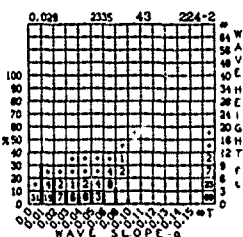
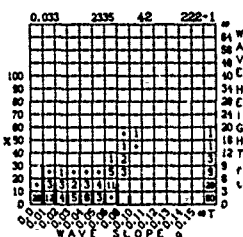
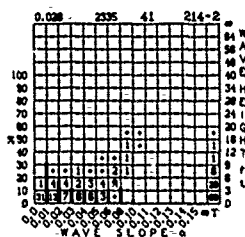
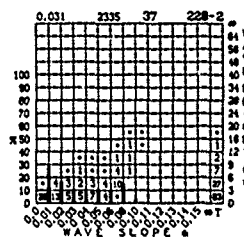
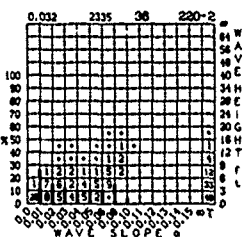
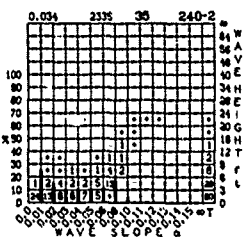
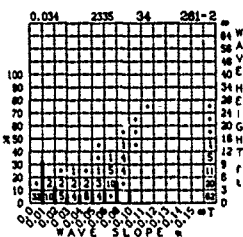
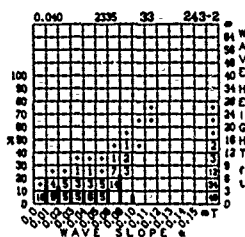
# WAVE



# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )

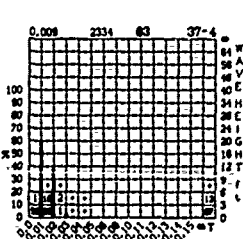
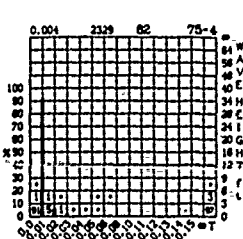
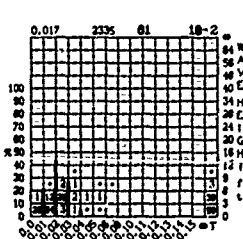
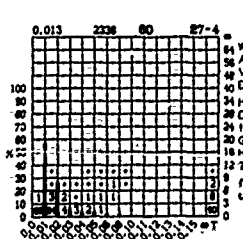
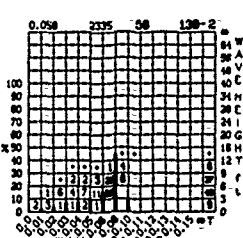
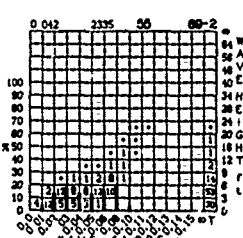
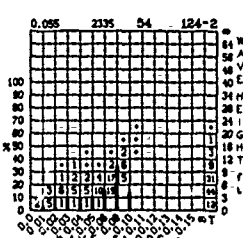
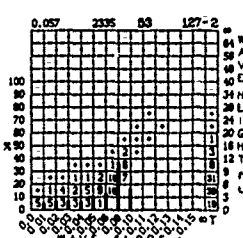
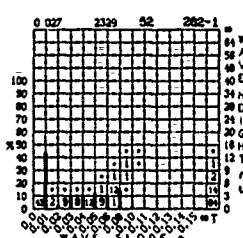
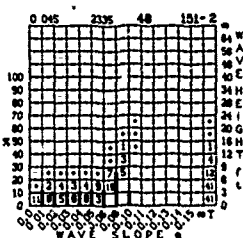
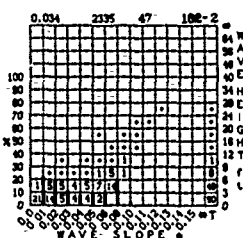
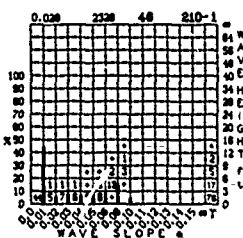
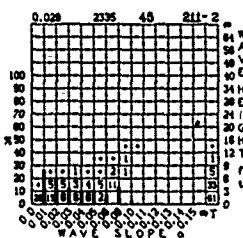
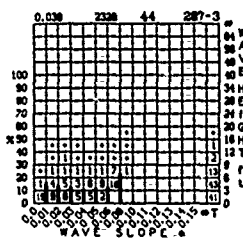
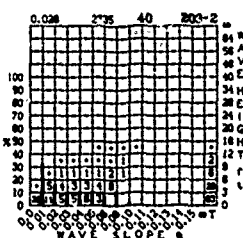
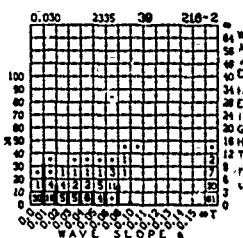
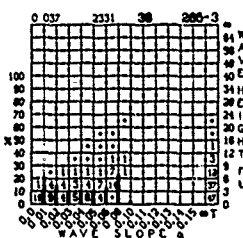
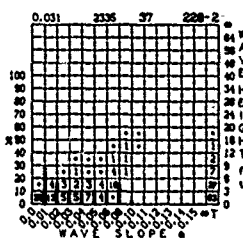
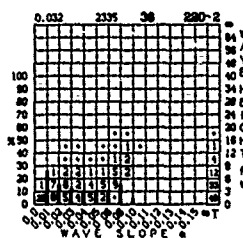


# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



E ( $\alpha$ ) (Cont'd)

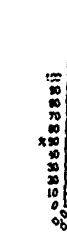
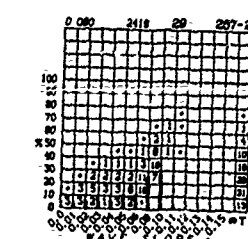
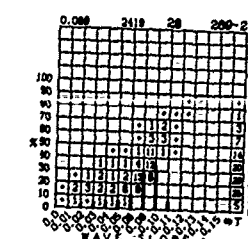
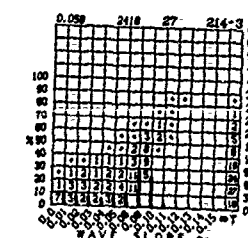
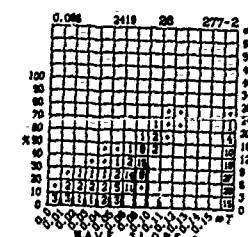
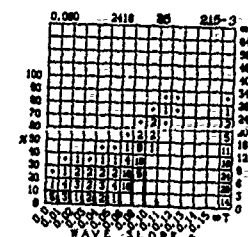
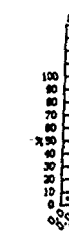
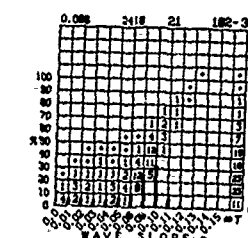
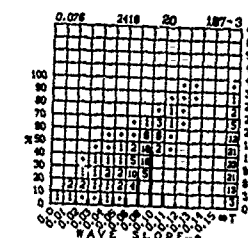
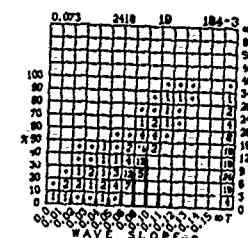
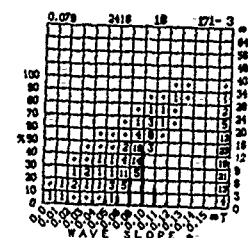
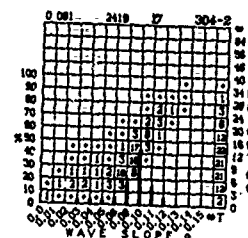
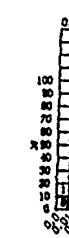
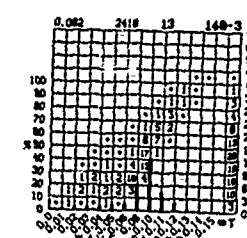
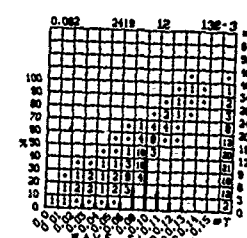
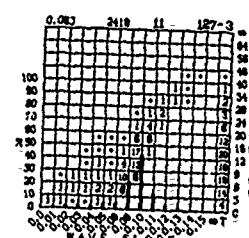
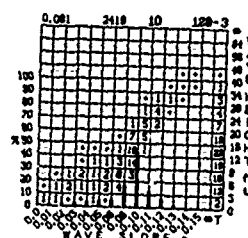
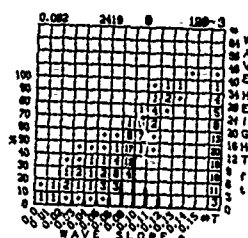
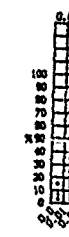
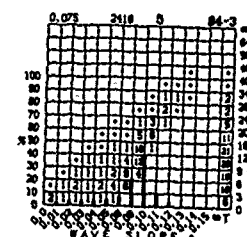
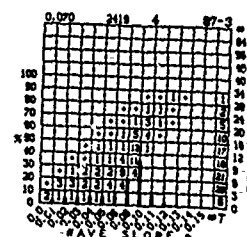
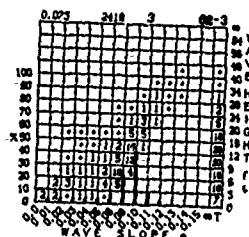
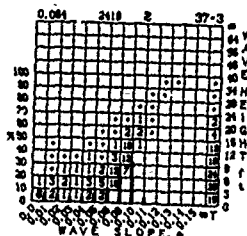
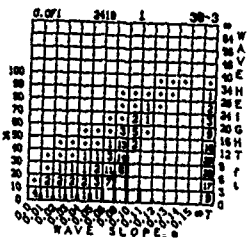
SEPTEMBER





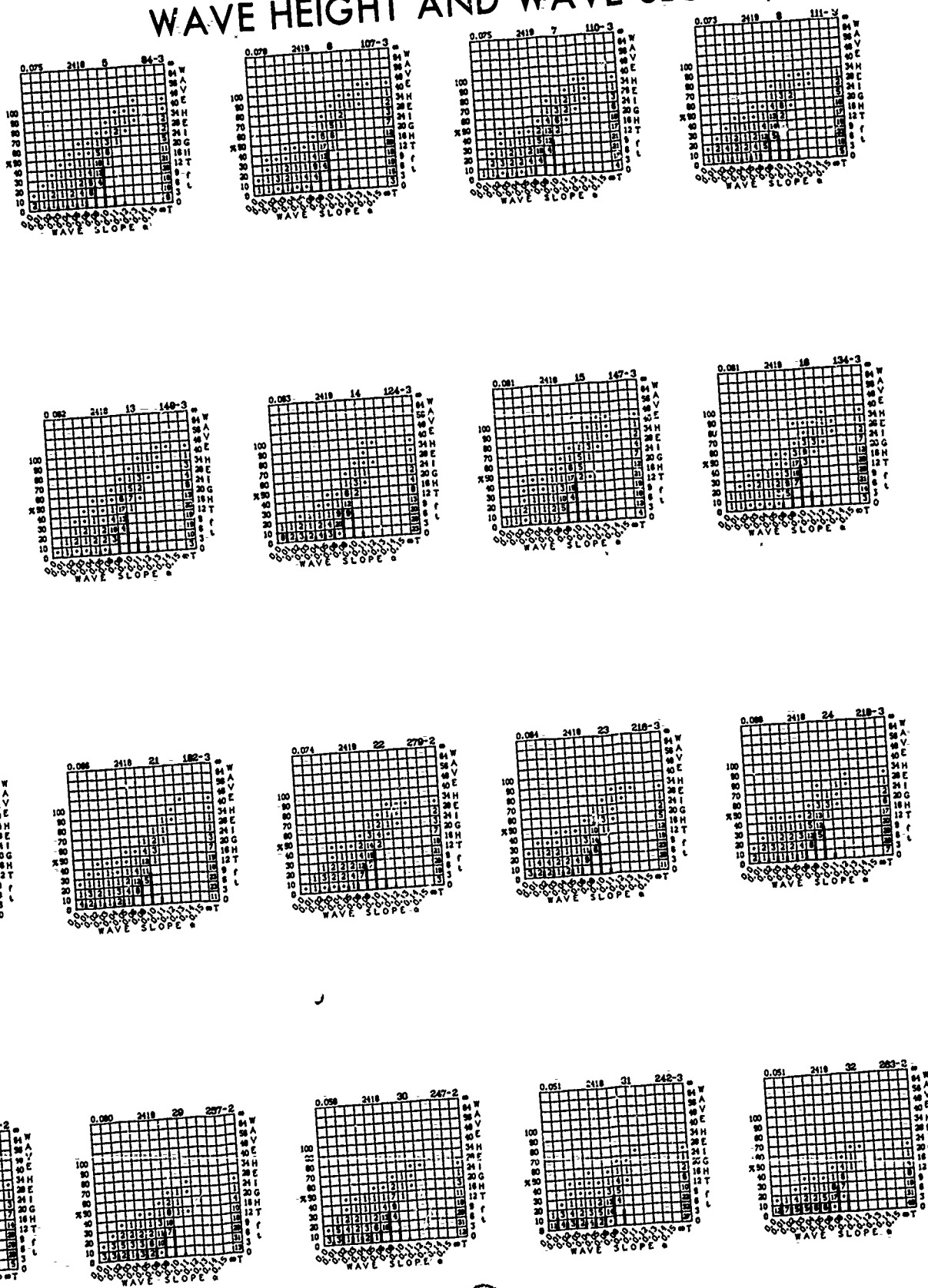
# OCTOBER

# WAVE

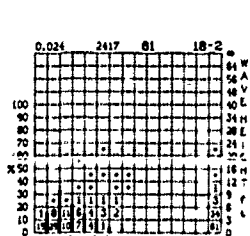
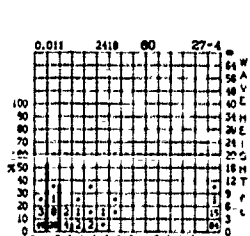
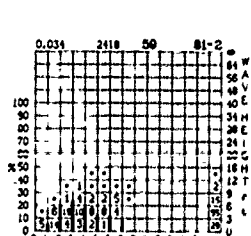
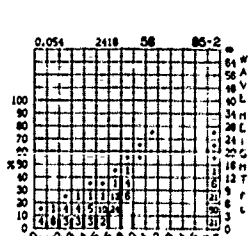
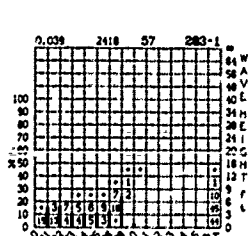
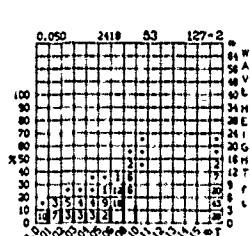
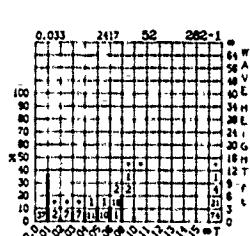
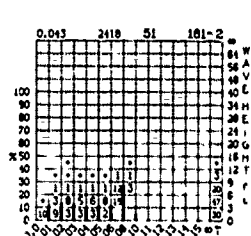
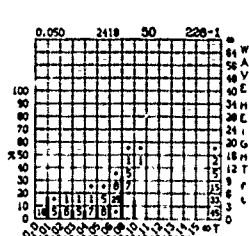
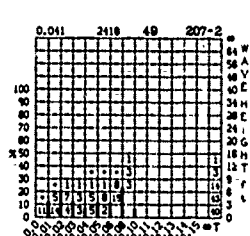
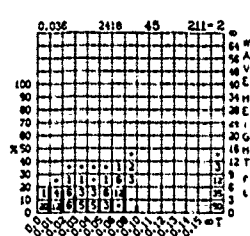
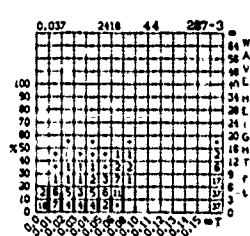
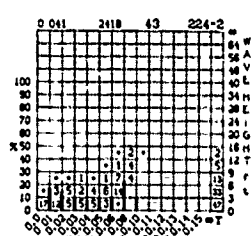
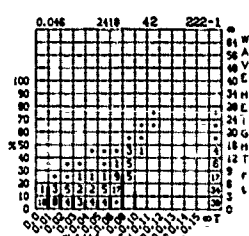
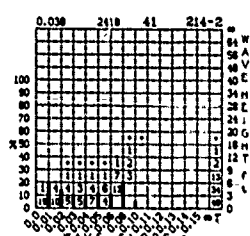
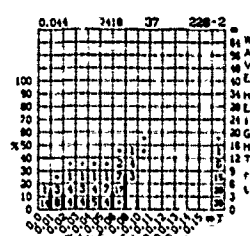
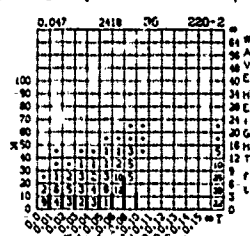
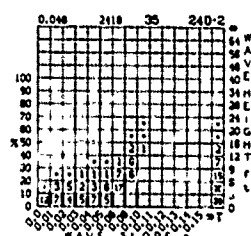
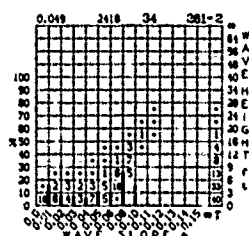
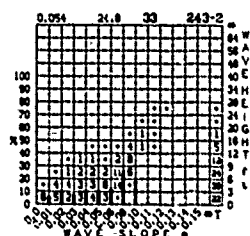




# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )



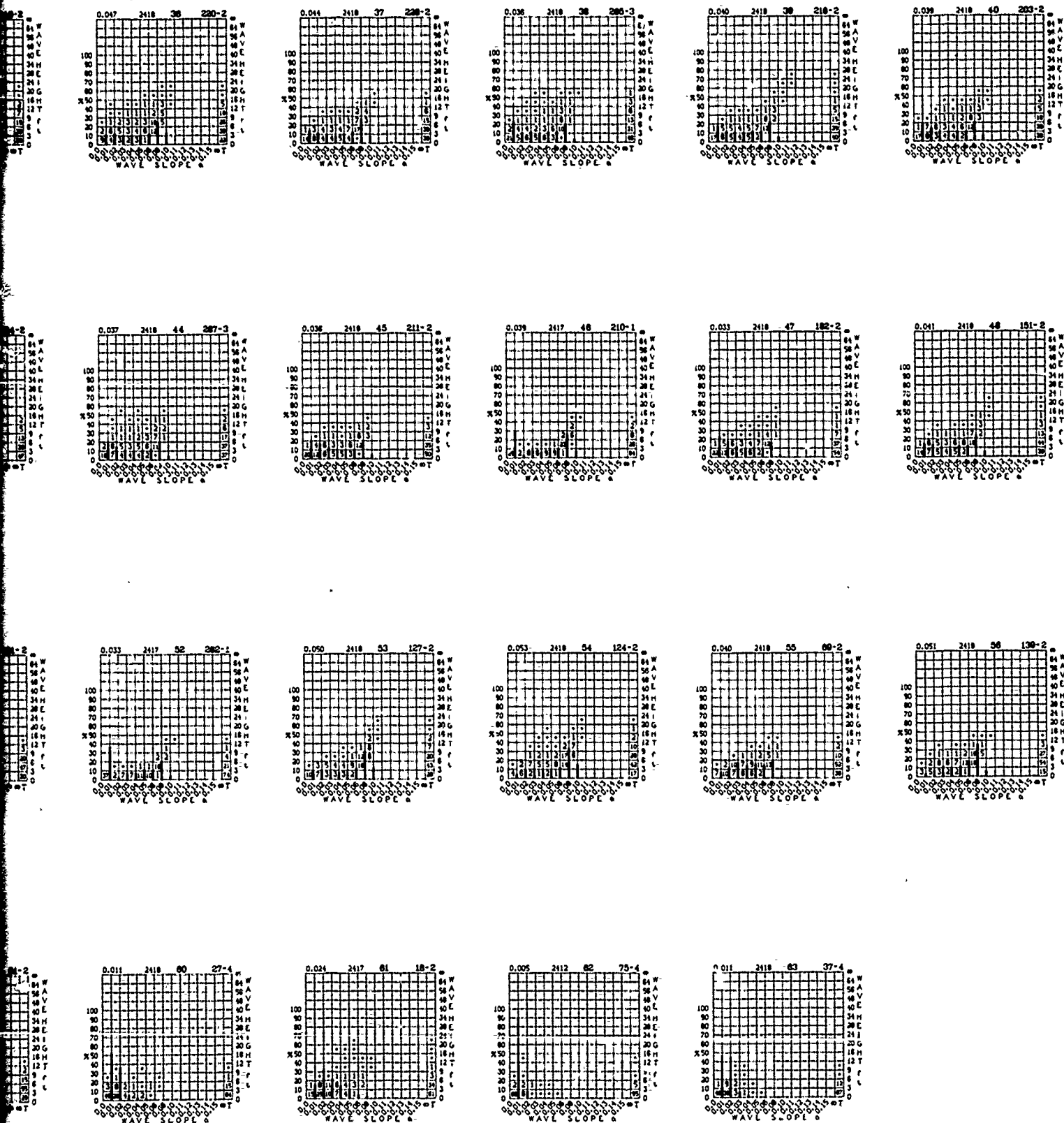
# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



①

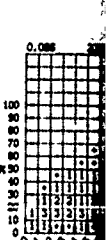
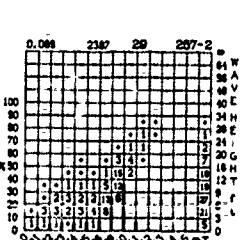
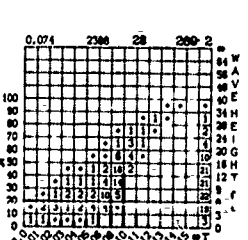
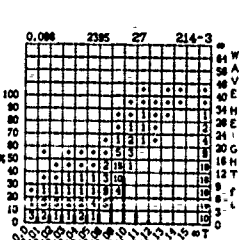
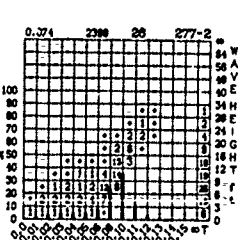
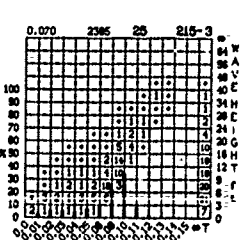
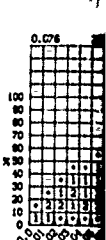
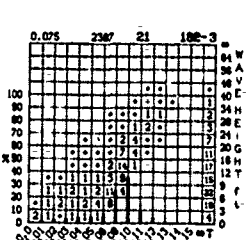
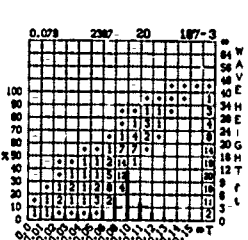
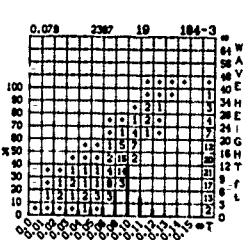
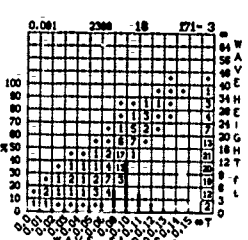
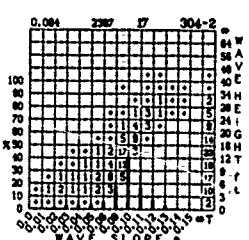
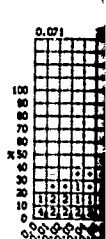
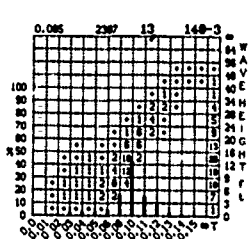
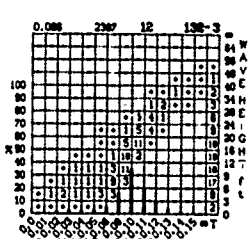
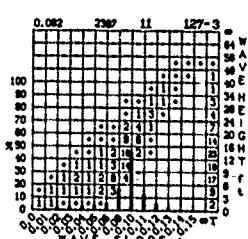
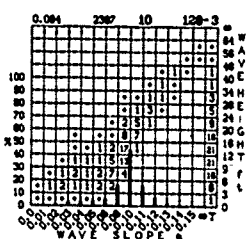
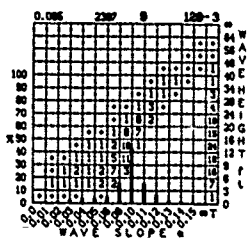
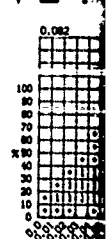
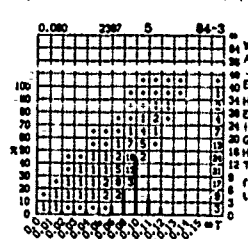
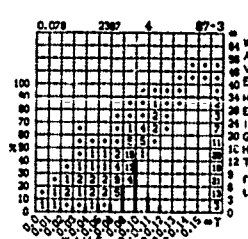
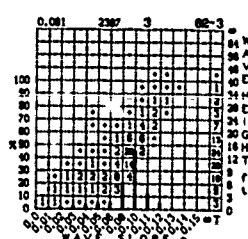
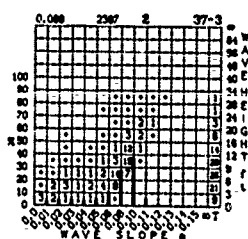
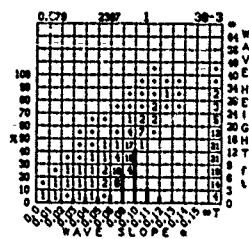
# SLOPE ( $\alpha$ ) (Cont'd)

OCTOBER



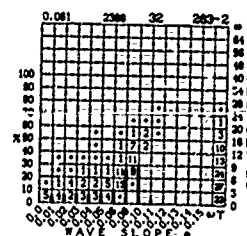
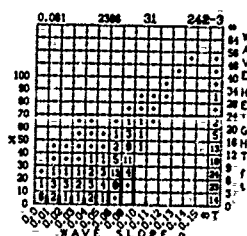
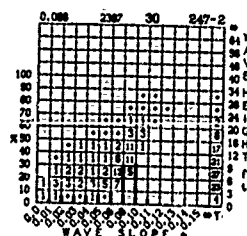
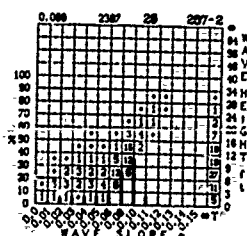
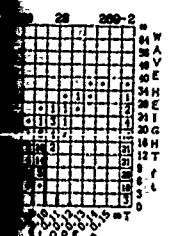
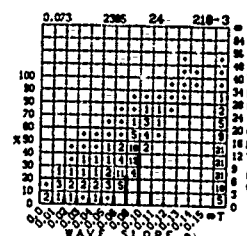
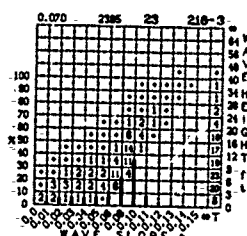
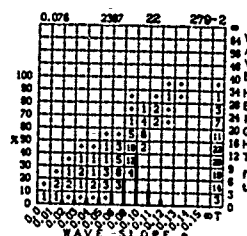
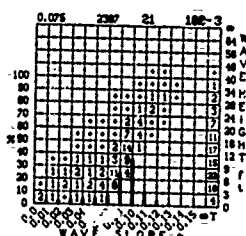
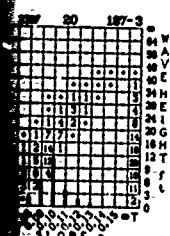
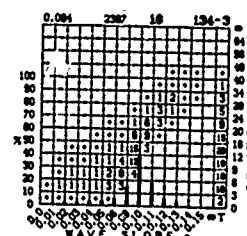
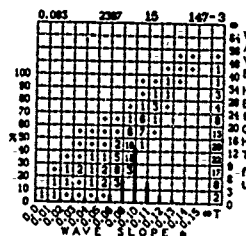
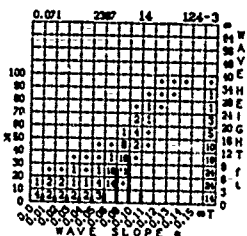
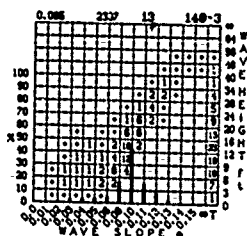
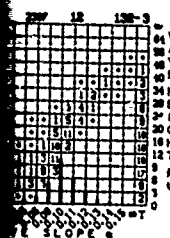
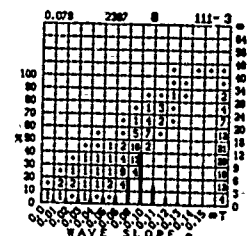
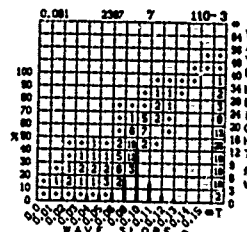
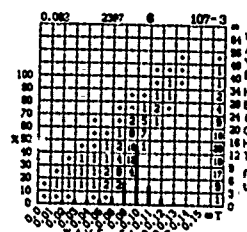
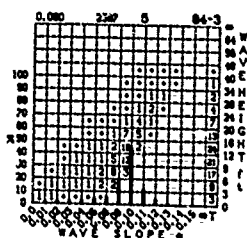
# NOVEMBER

# WAVE H

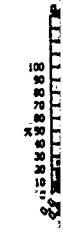
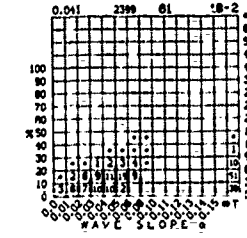
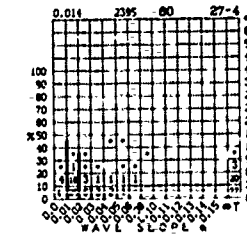
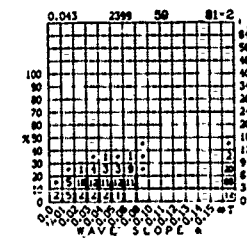
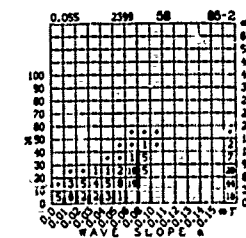
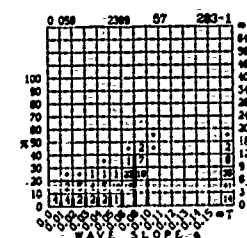
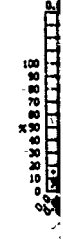
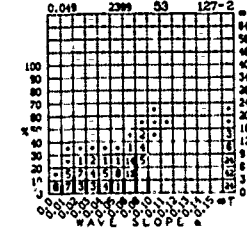
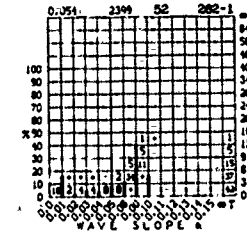
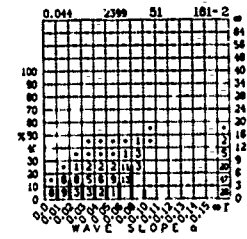
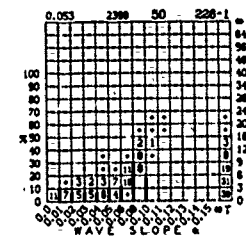
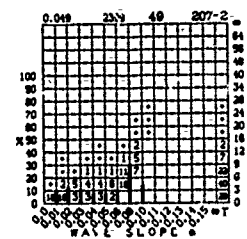
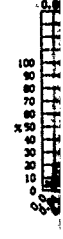
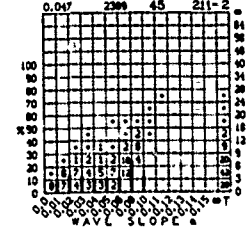
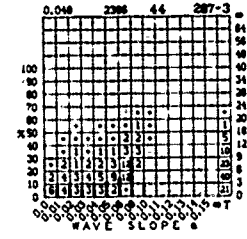
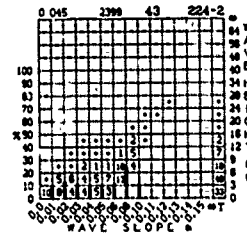
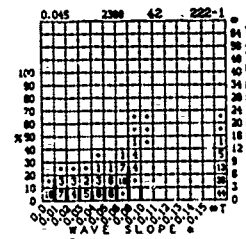
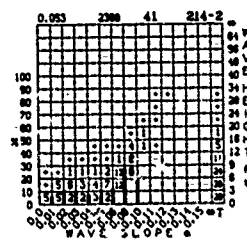
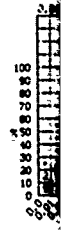
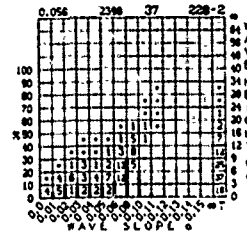
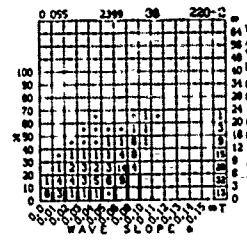
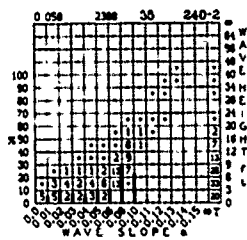
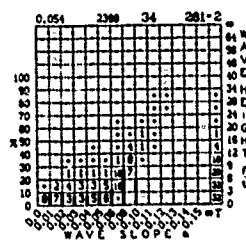
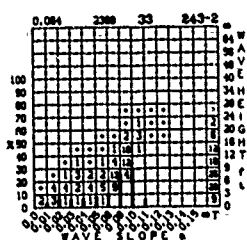


①

## WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )

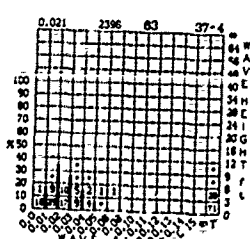
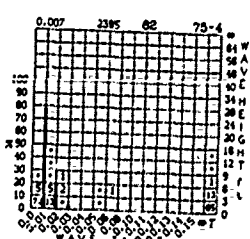
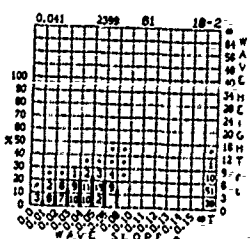
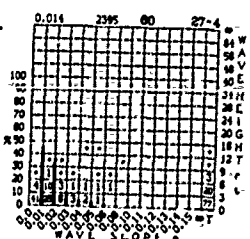
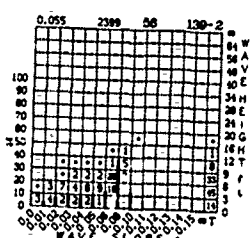
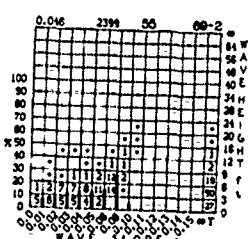
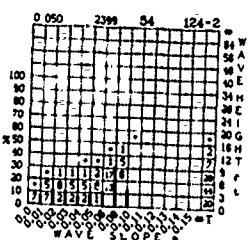
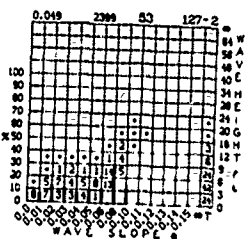
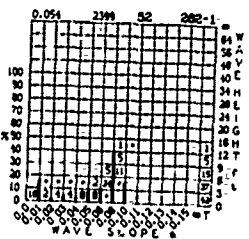
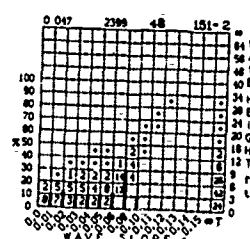
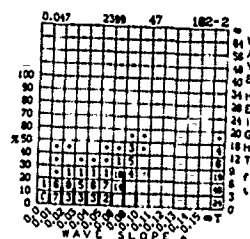
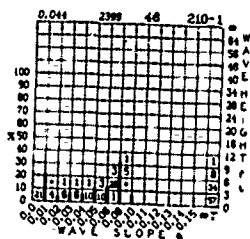
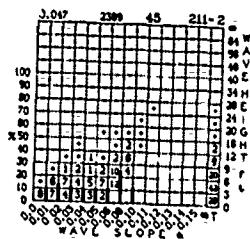
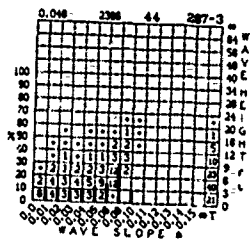
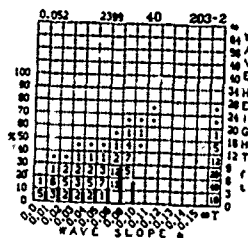
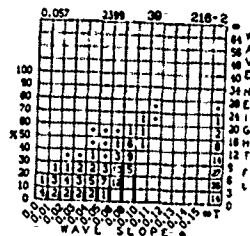
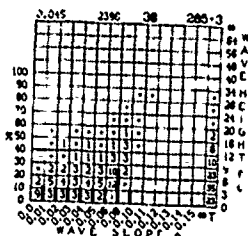
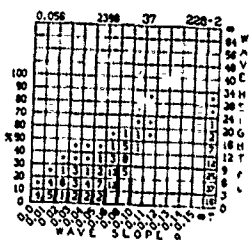
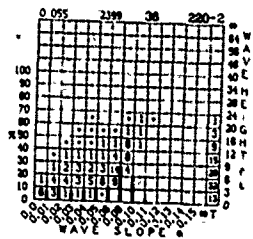


# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



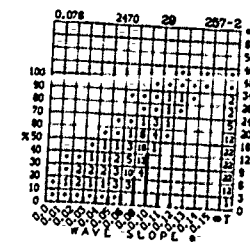
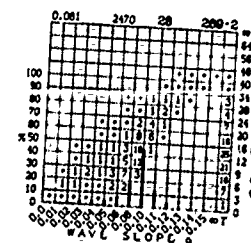
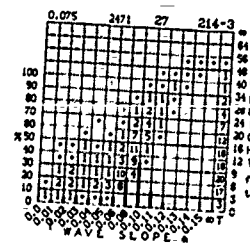
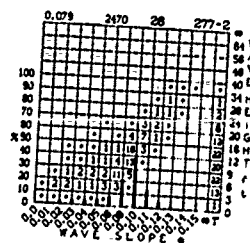
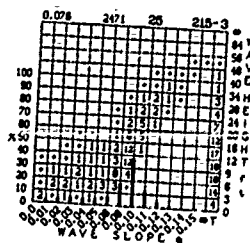
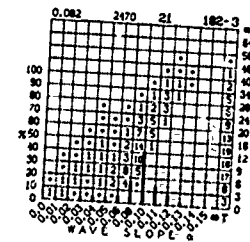
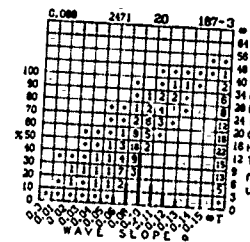
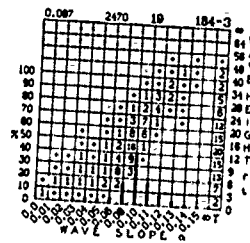
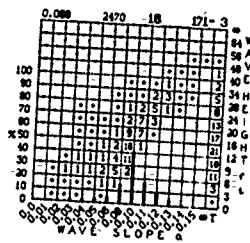
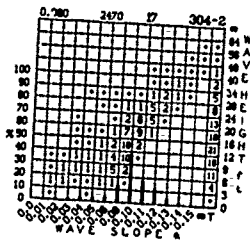
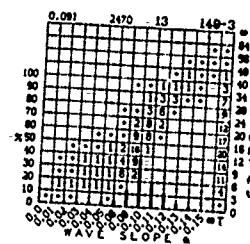
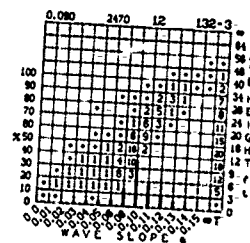
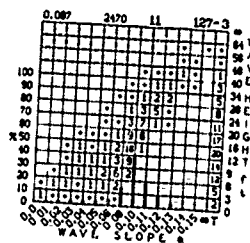
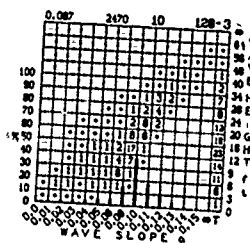
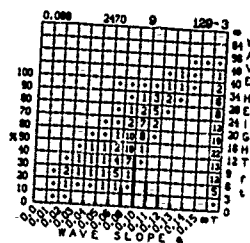
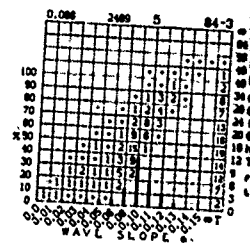
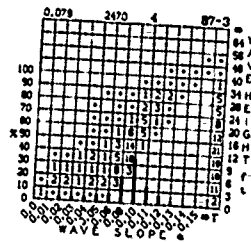
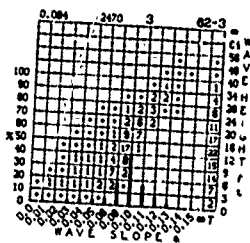
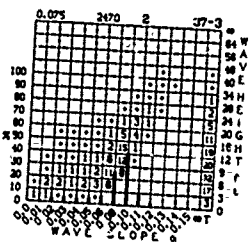
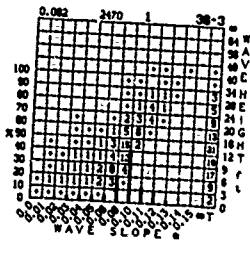
E ( $\alpha$ ) (Cont'd)

NOVEMBER



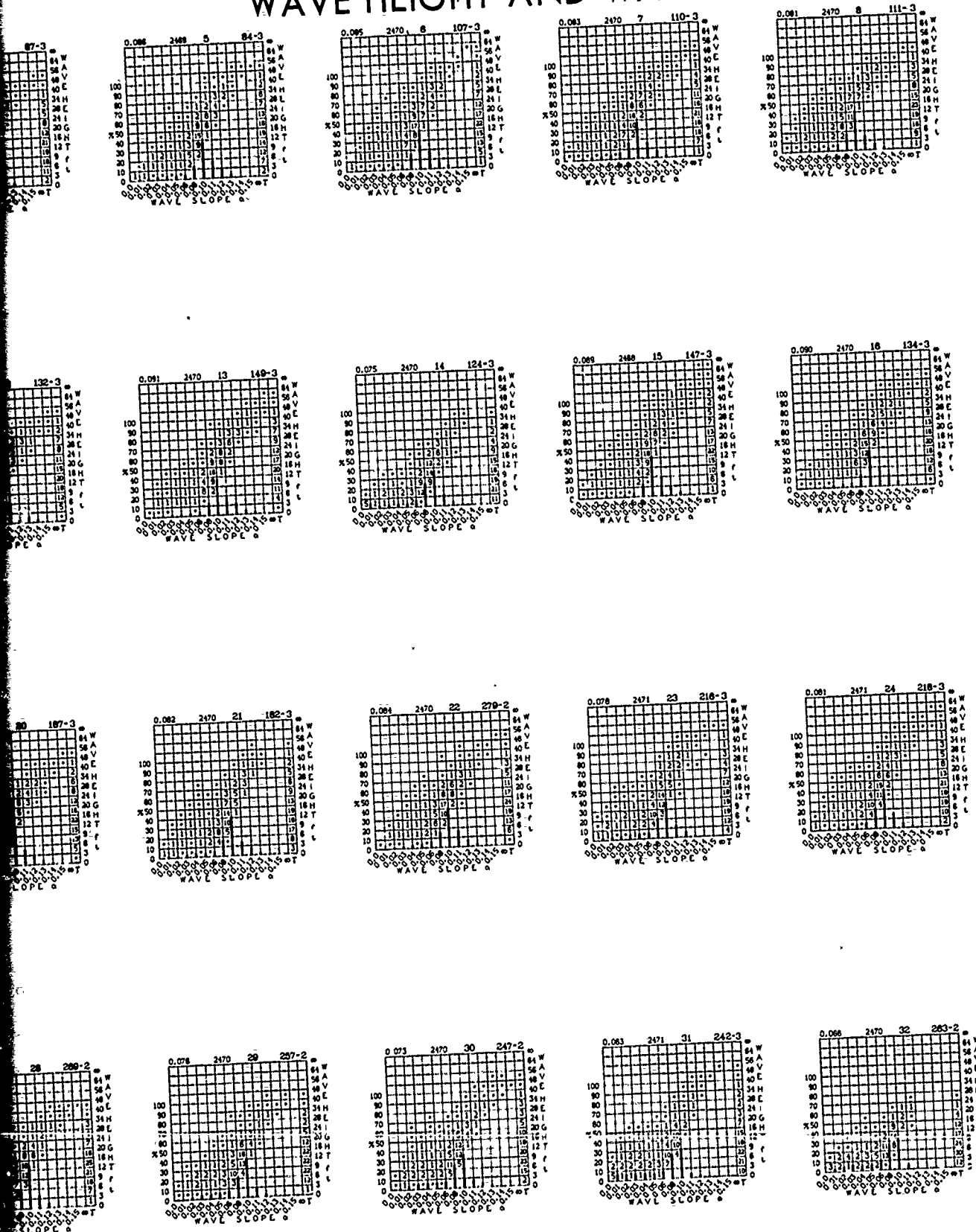


# DECEMBER

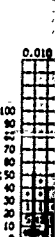
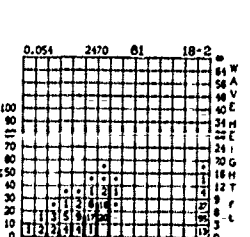
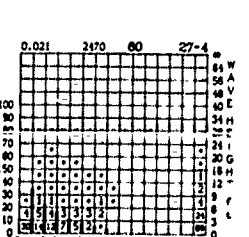
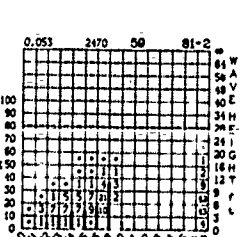
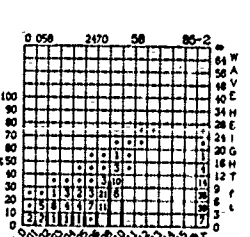
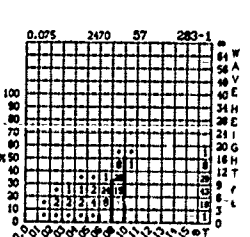
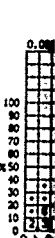
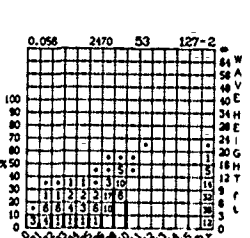
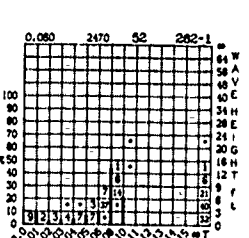
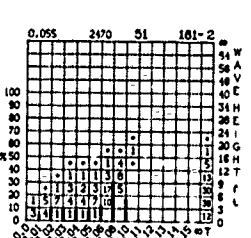
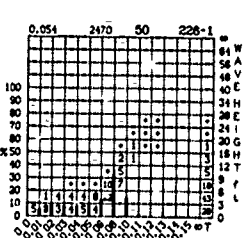
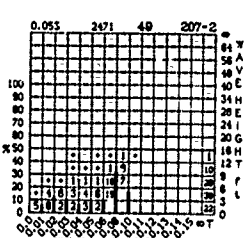
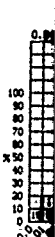
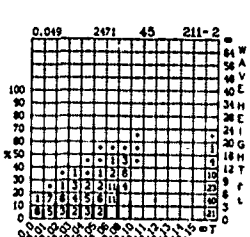
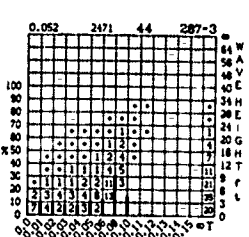
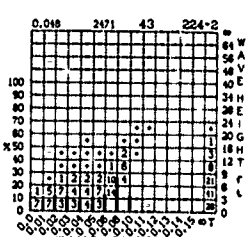
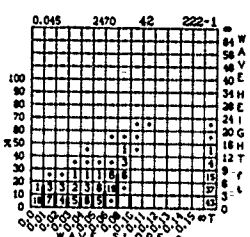
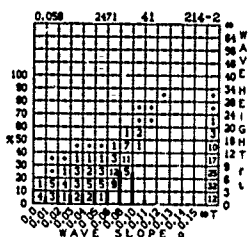
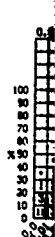
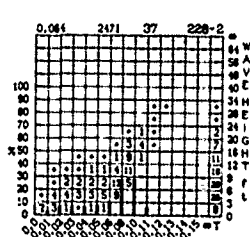
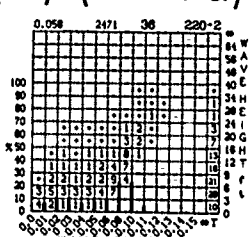
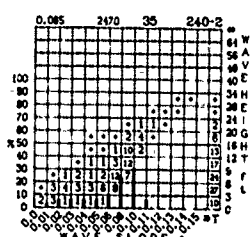
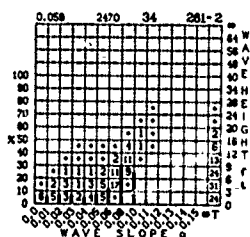
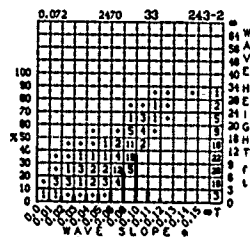




# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )

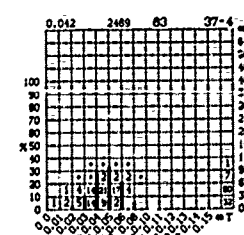
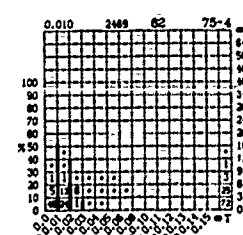
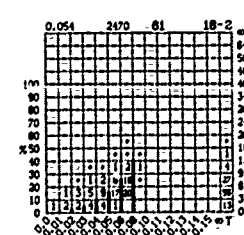
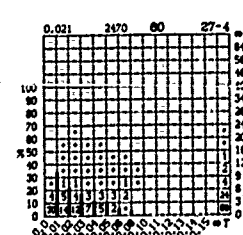
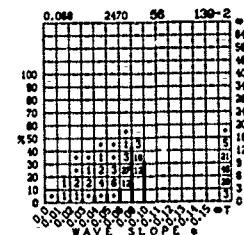
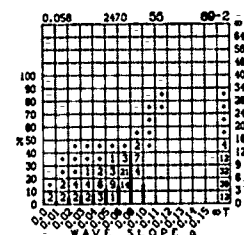
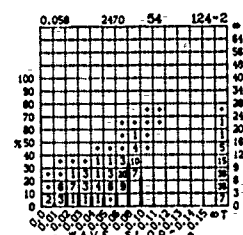
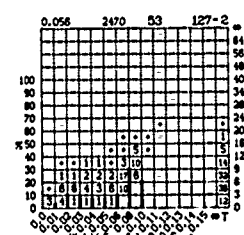
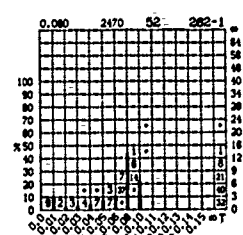
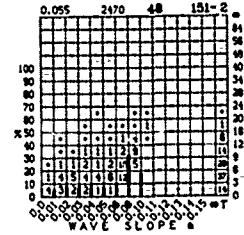
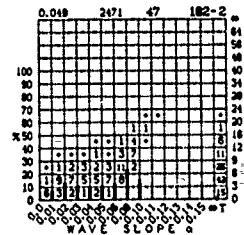
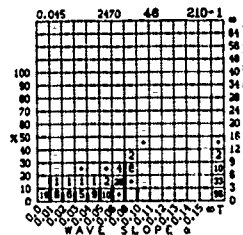
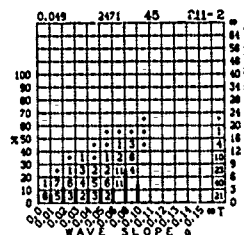
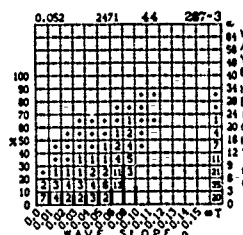
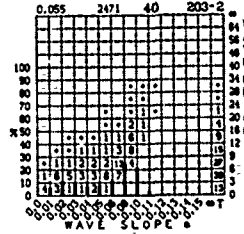
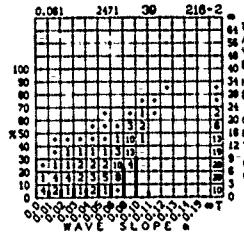
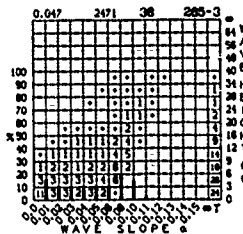
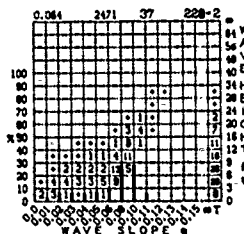
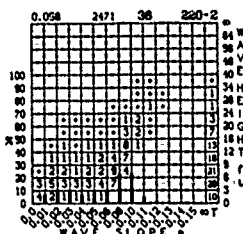


# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)



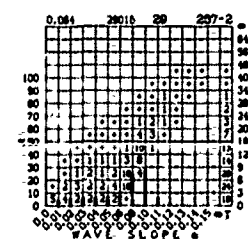
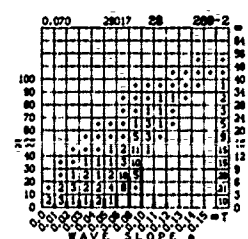
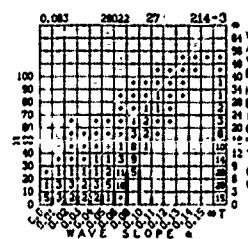
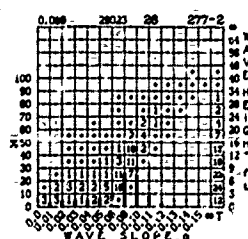
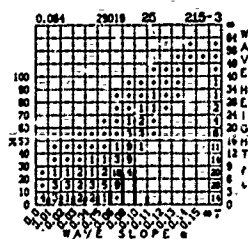
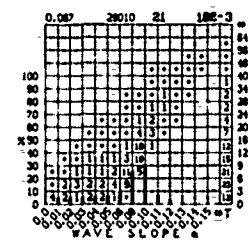
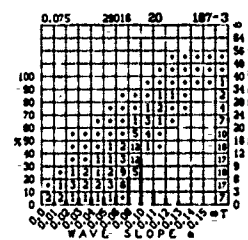
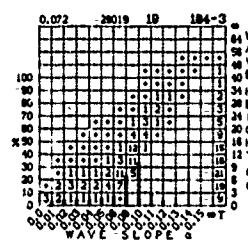
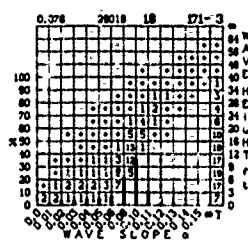
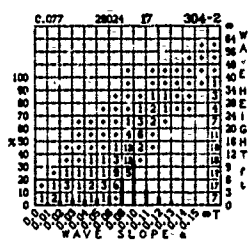
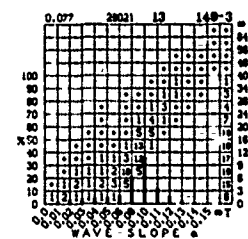
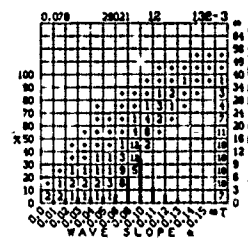
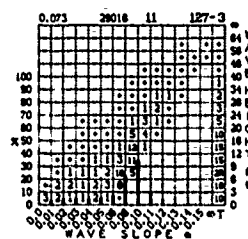
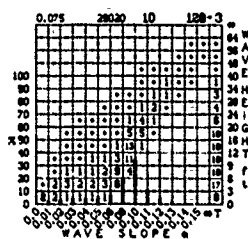
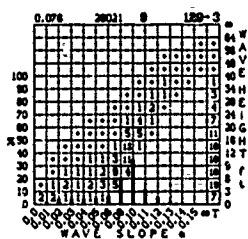
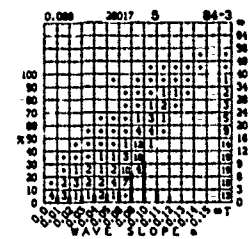
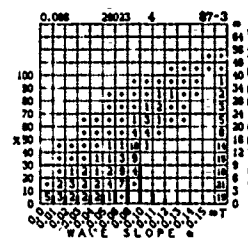
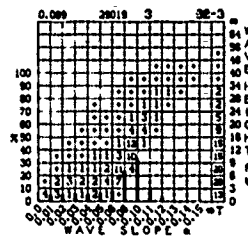
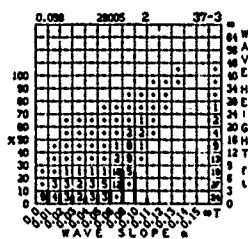
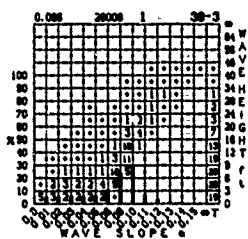
(α) (Cont'd)

DECEMBER

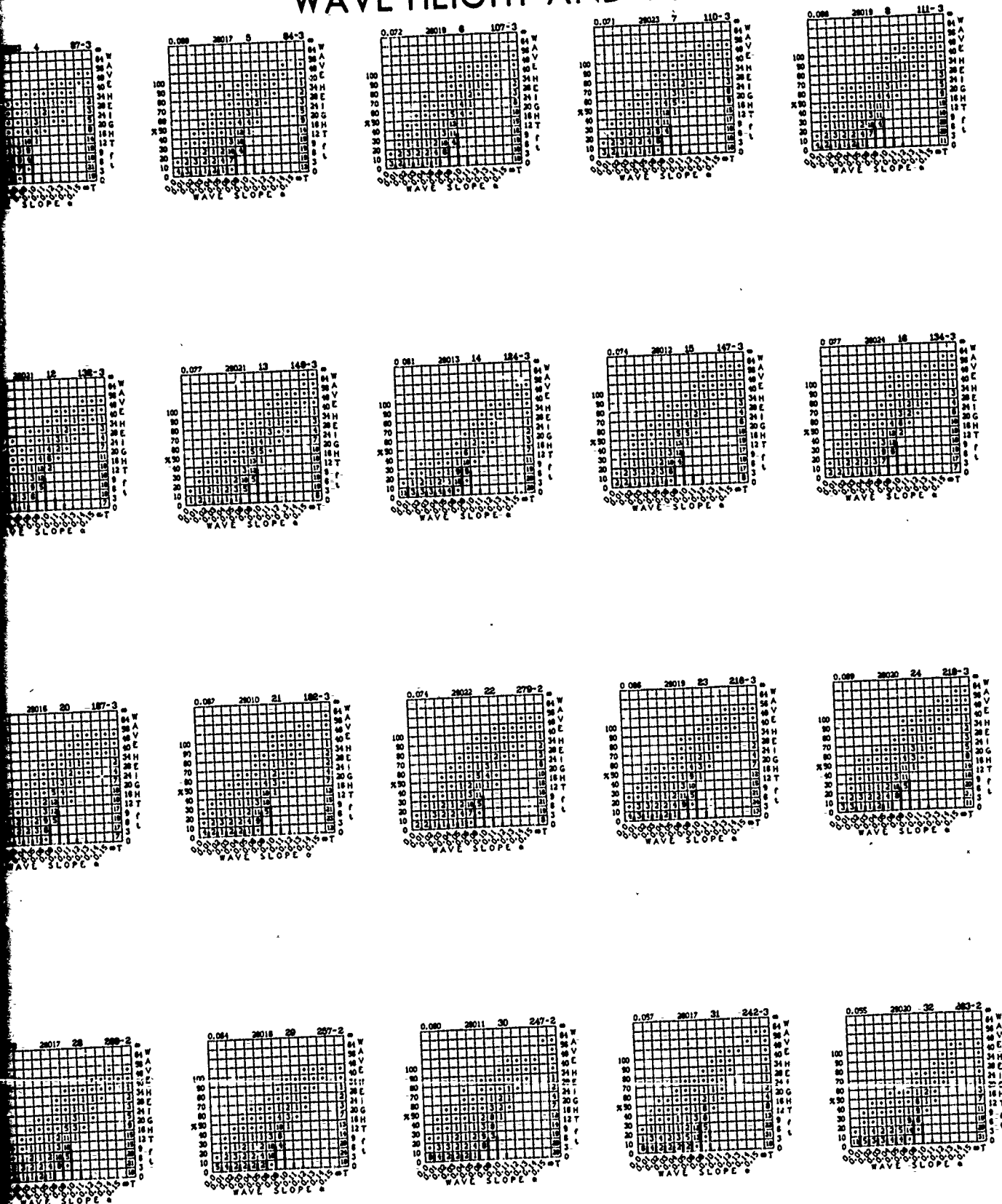


# ANNUAL

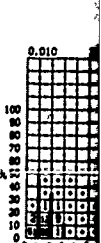
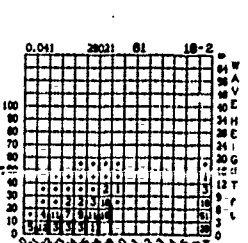
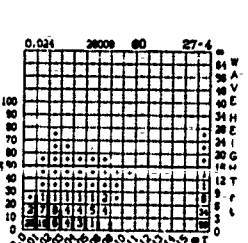
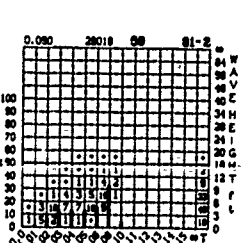
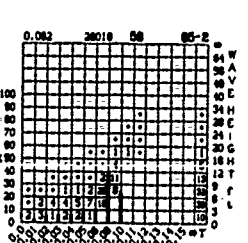
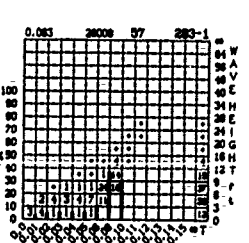
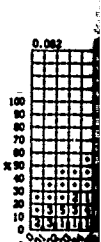
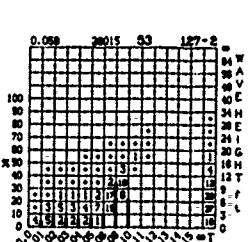
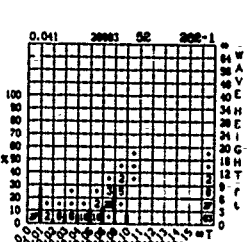
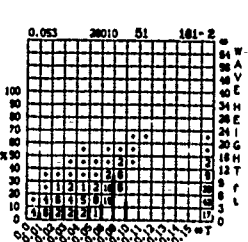
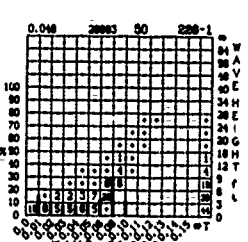
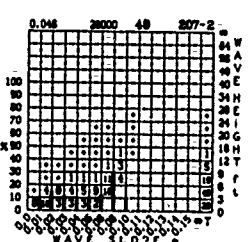
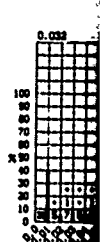
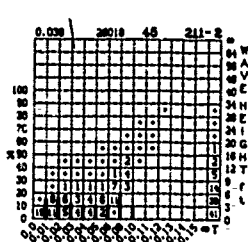
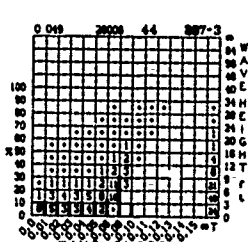
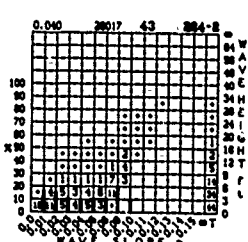
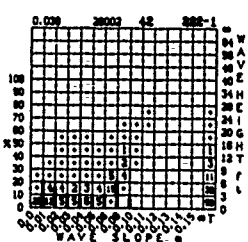
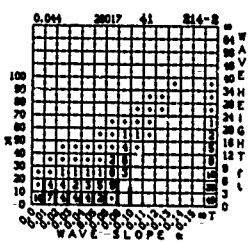
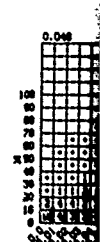
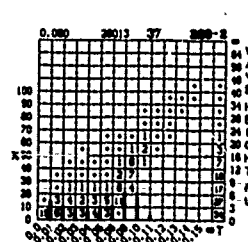
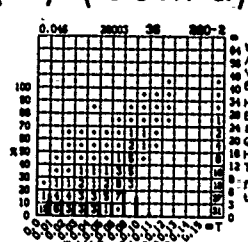
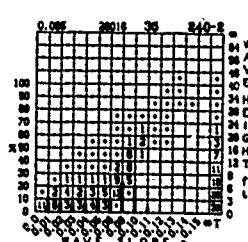
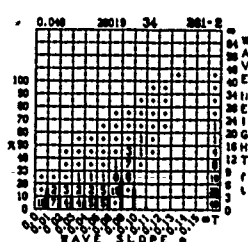
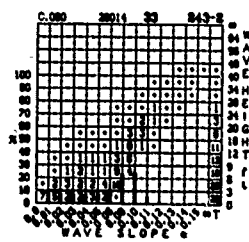
# WAVE



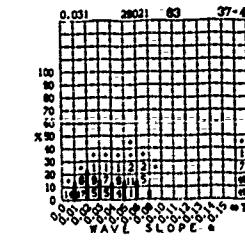
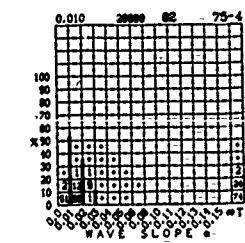
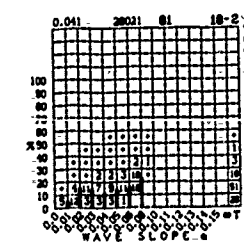
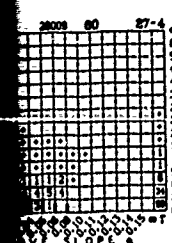
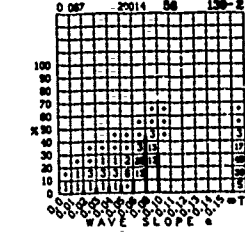
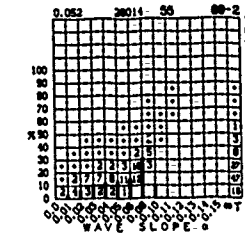
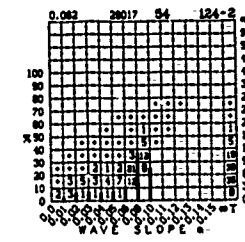
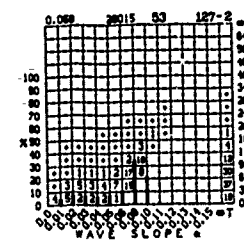
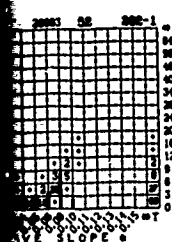
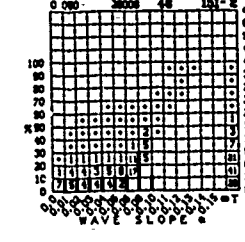
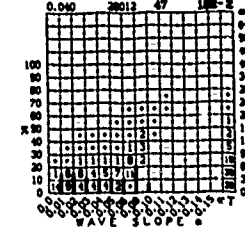
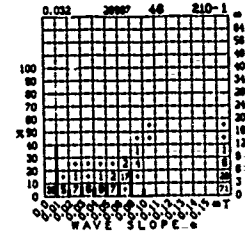
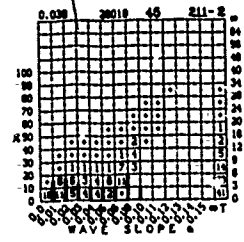
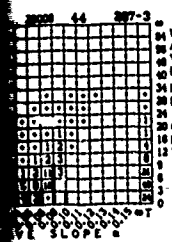
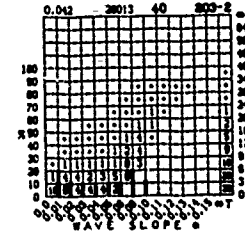
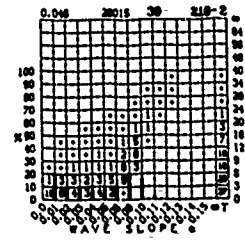
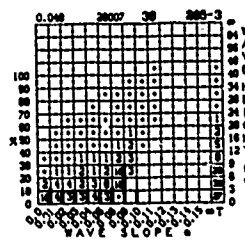
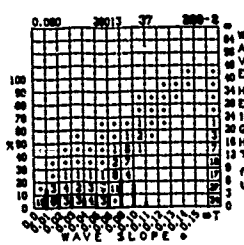
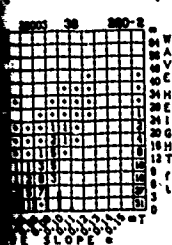
# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ )



# WAVE HEIGHT AND WAVE SLOPE ( $\alpha$ ) (Cont'd)

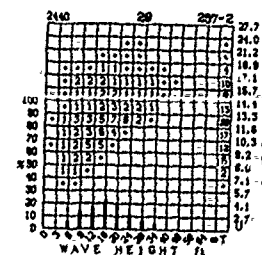
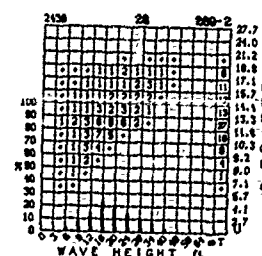
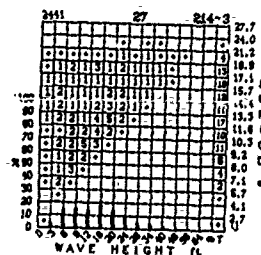
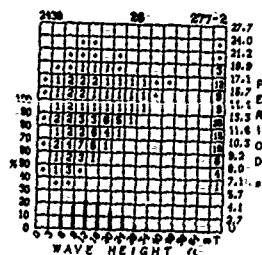
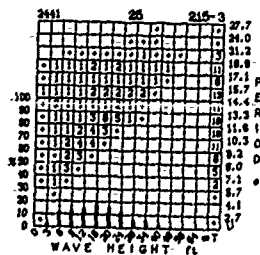
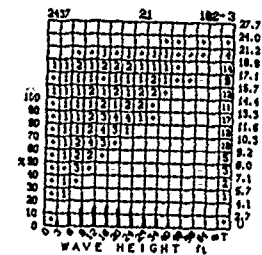
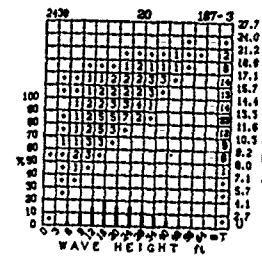
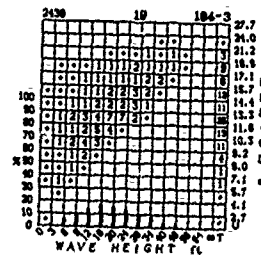
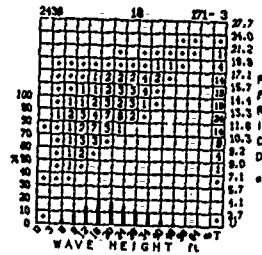
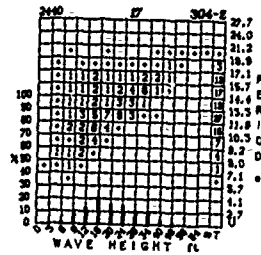
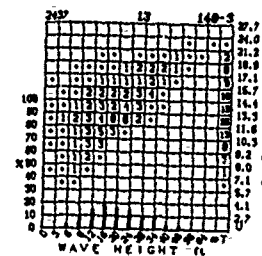
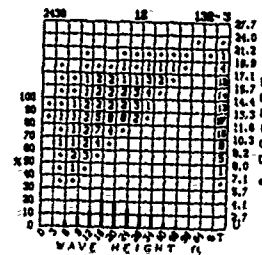
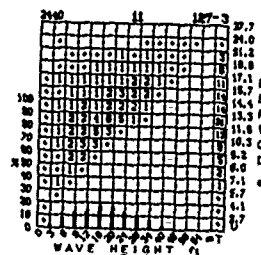
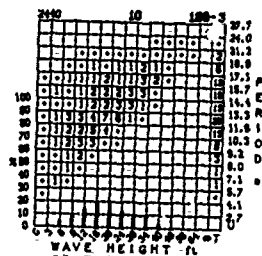
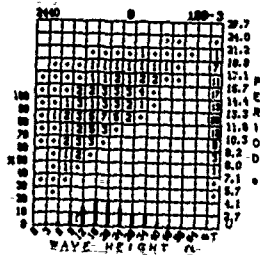
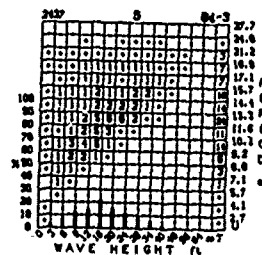
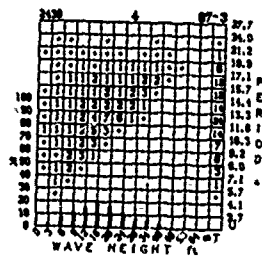
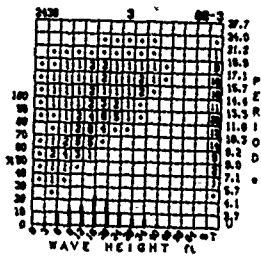
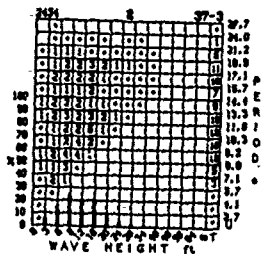
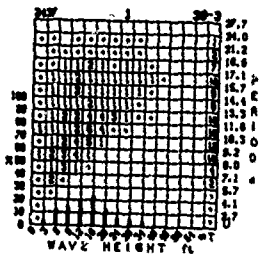


# ANNUAL



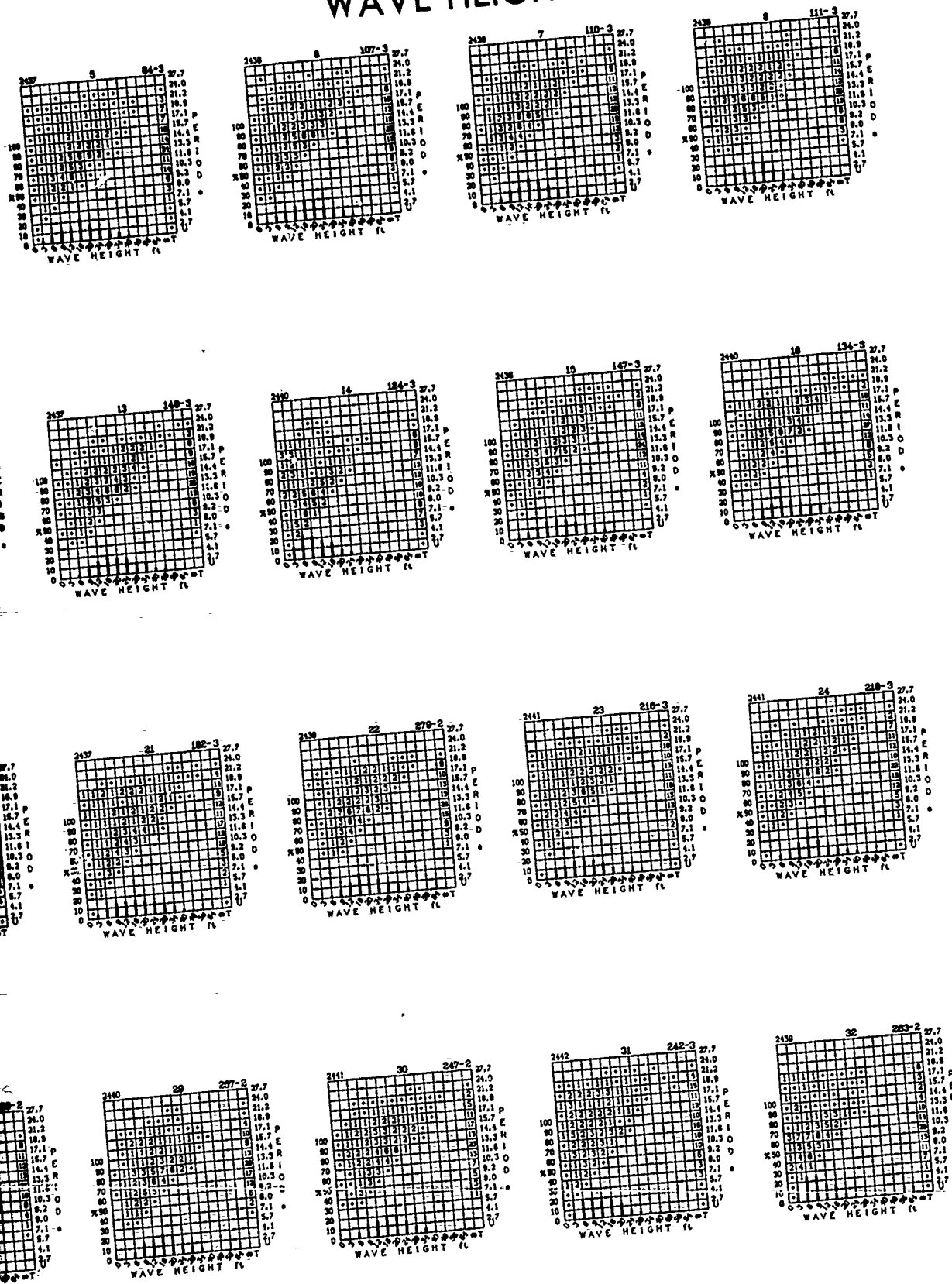


# JANUARY

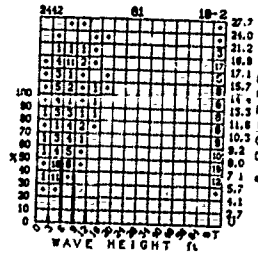
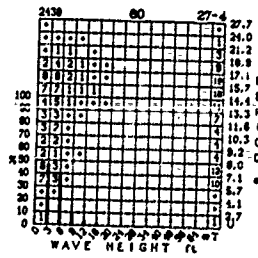
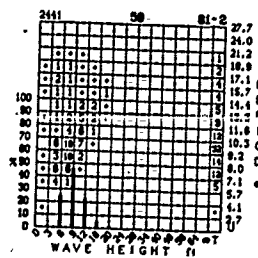
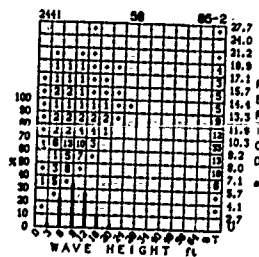
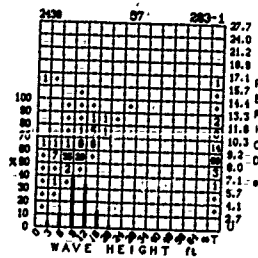
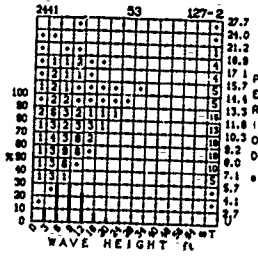
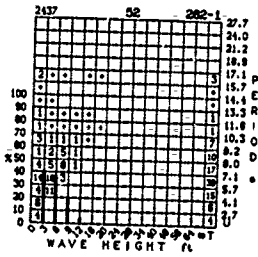
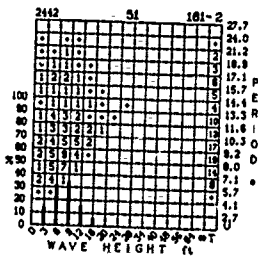
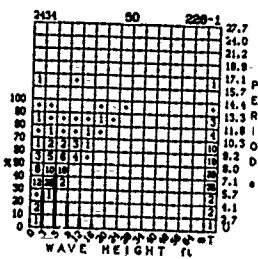
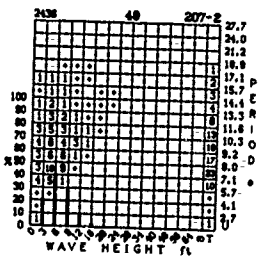
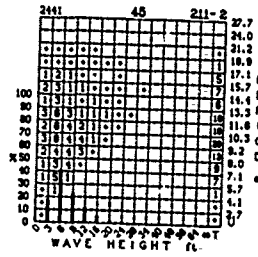
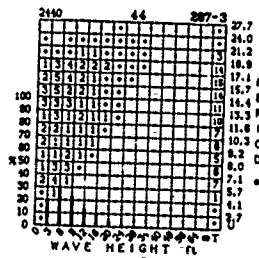
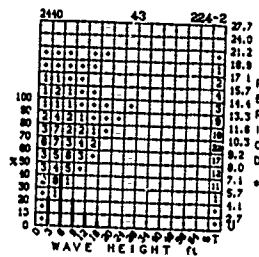
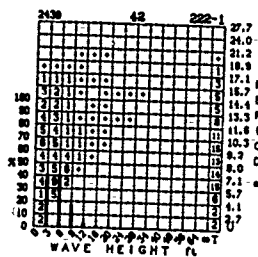
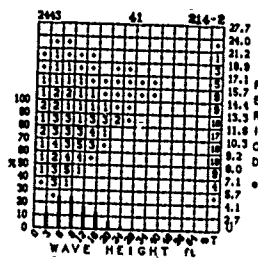
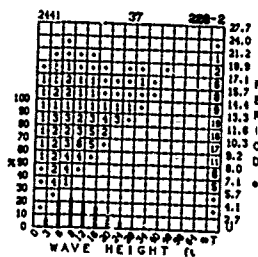
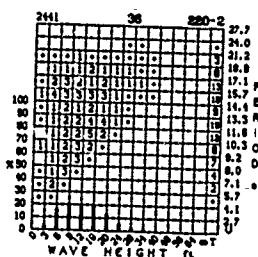
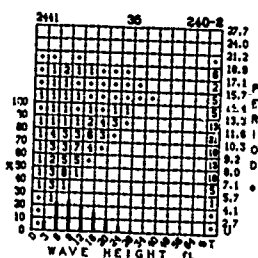
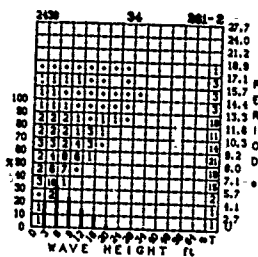
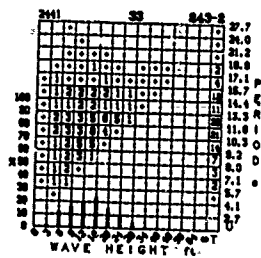




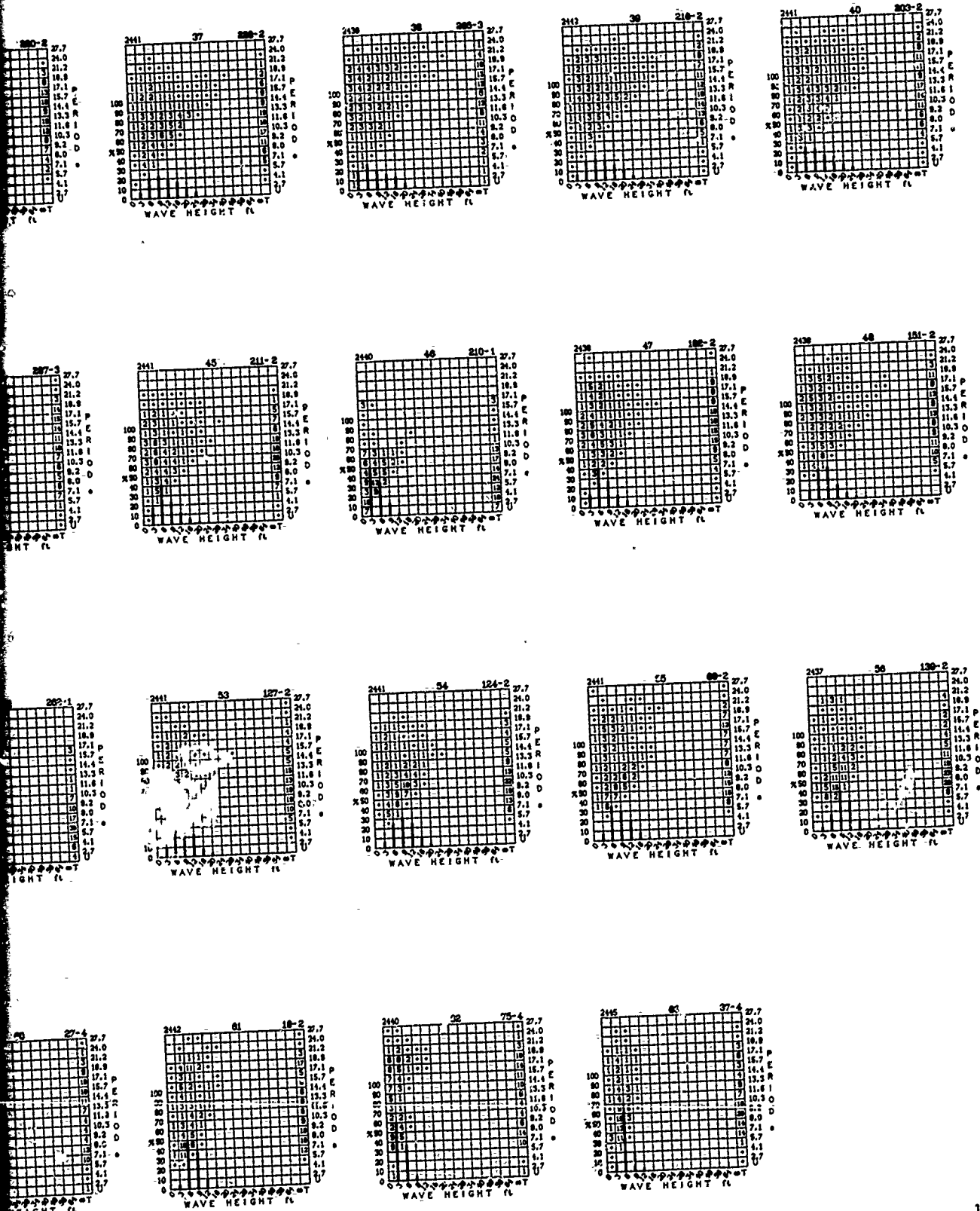
# WAVE HEIGHT AND PERIOD



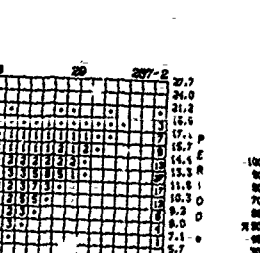
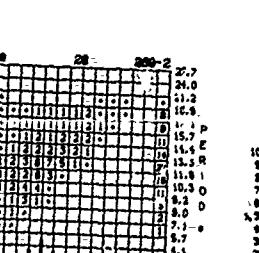
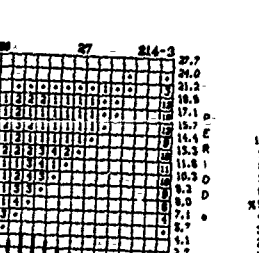
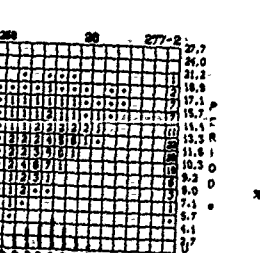
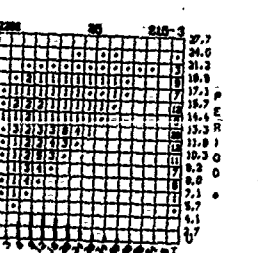
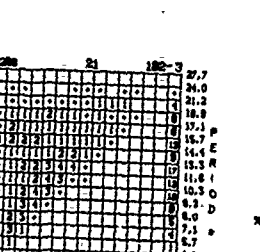
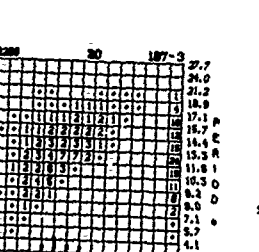
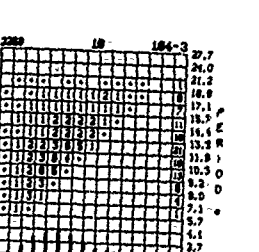
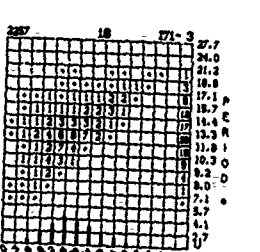
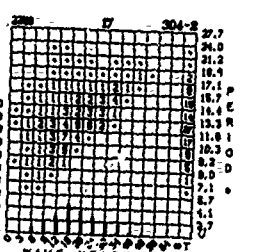
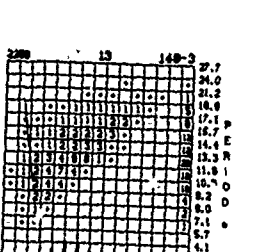
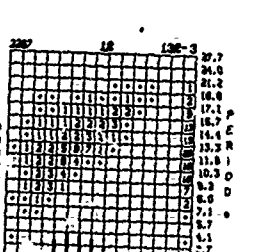
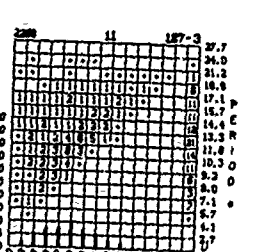
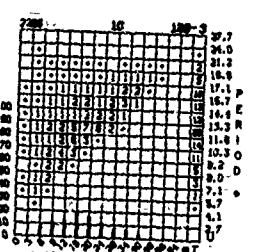
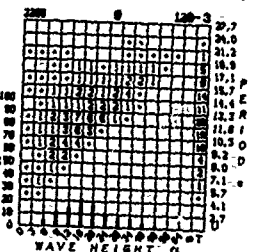
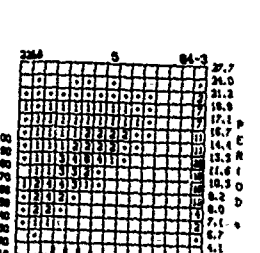
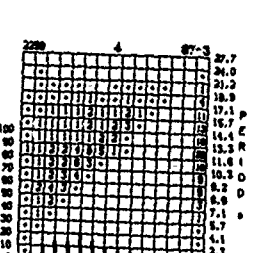
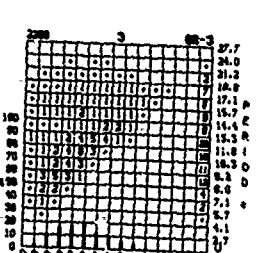
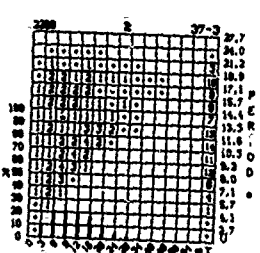
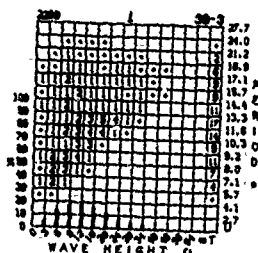
# WAVE HEIGHT AND PERIOD (Cont'd)



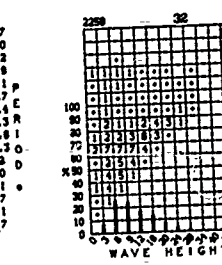
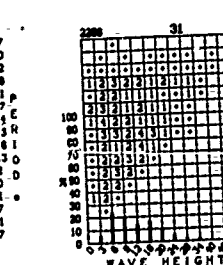
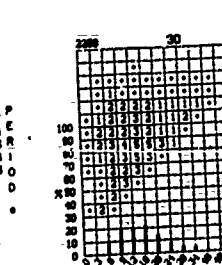
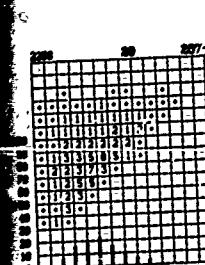
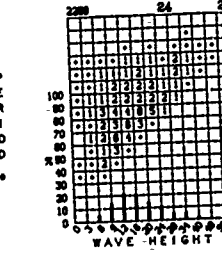
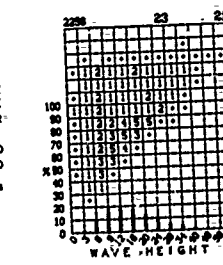
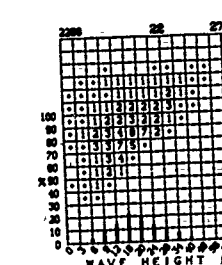
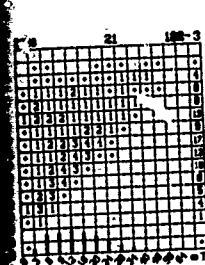
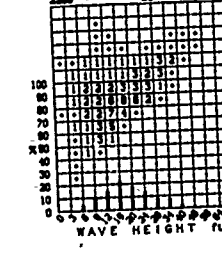
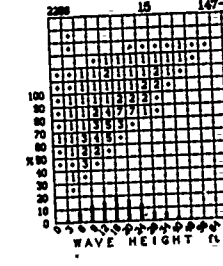
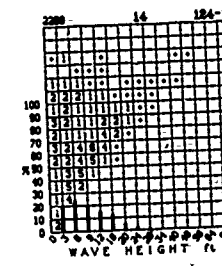
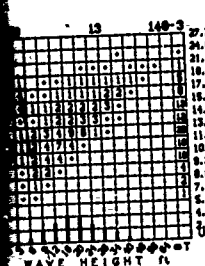
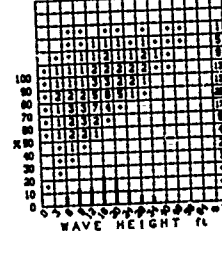
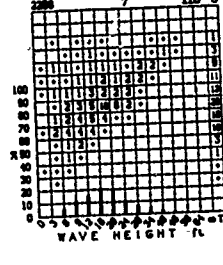
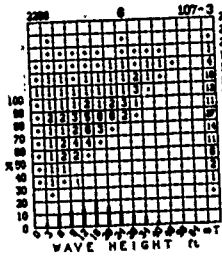
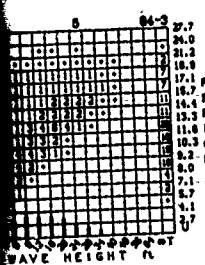
# JANUARY



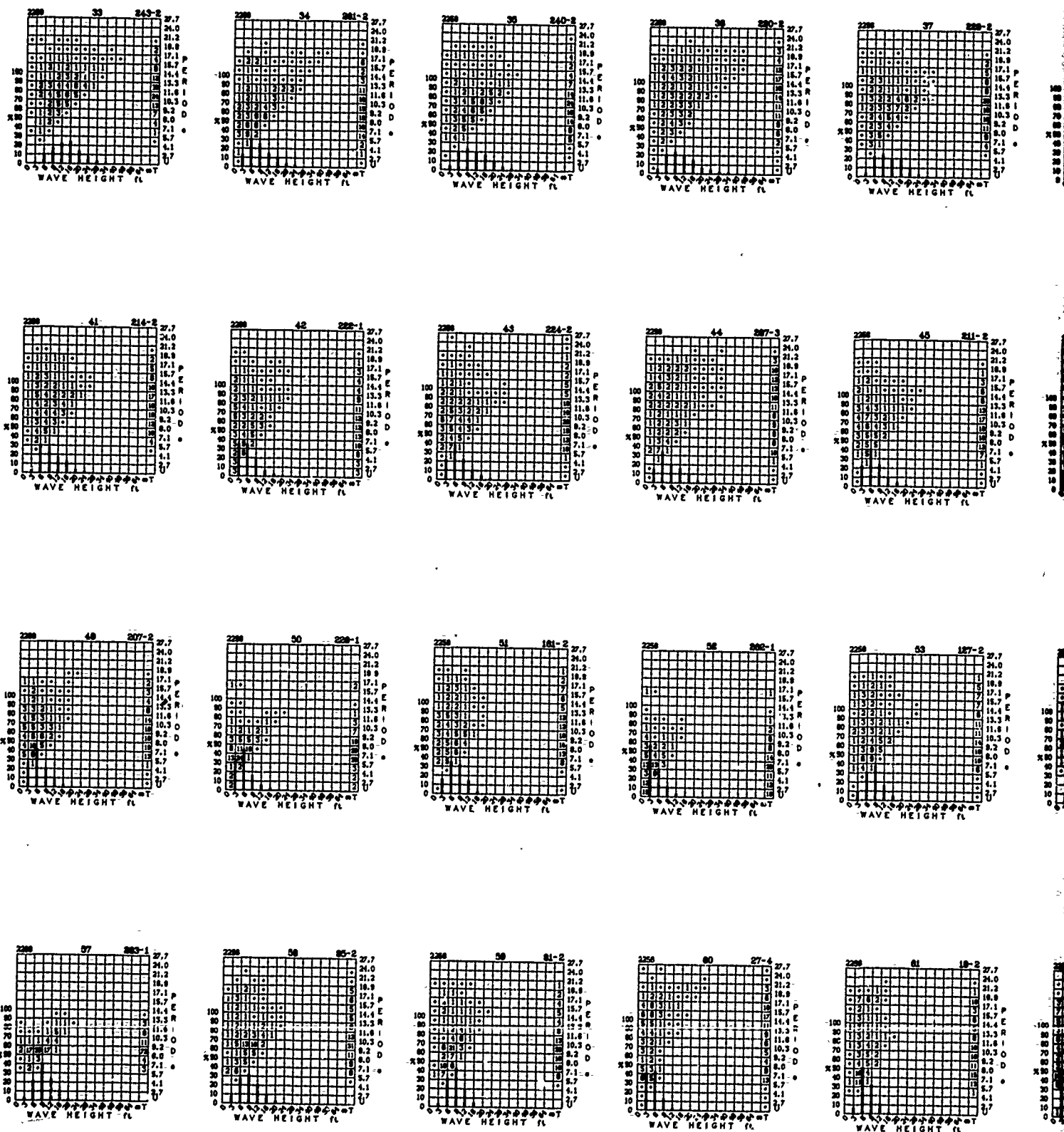
# FEBRUARY



# WAVE HEIGHT AND PERIOD

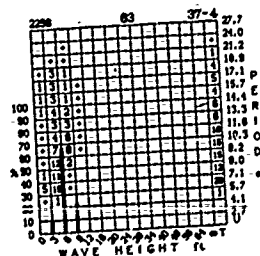
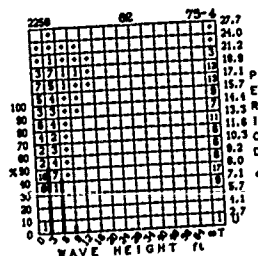
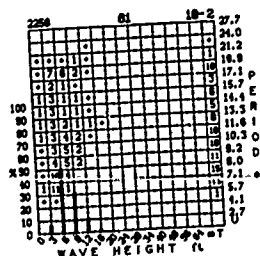
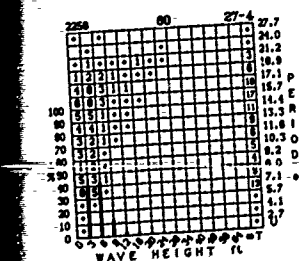
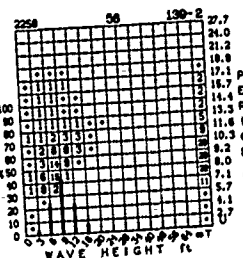
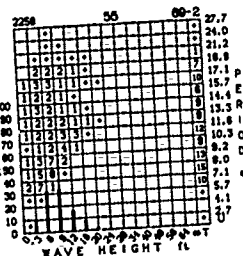
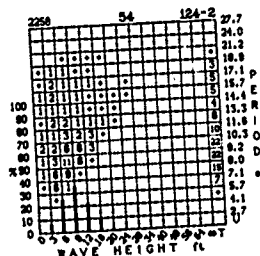
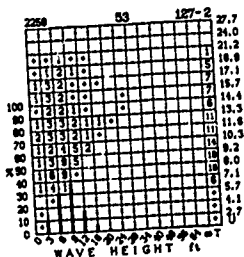
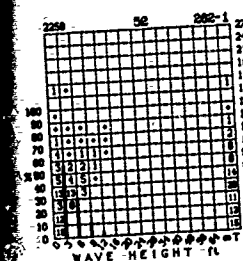
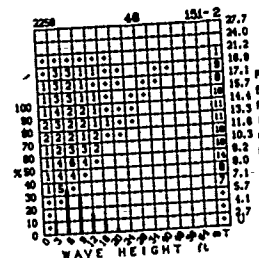
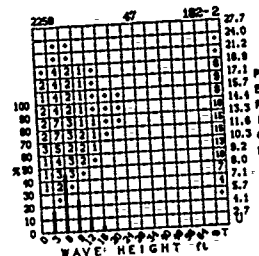
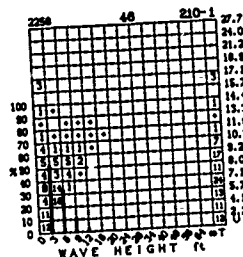
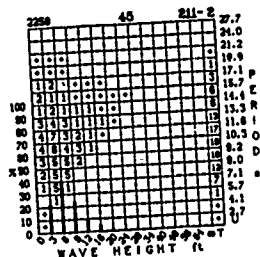
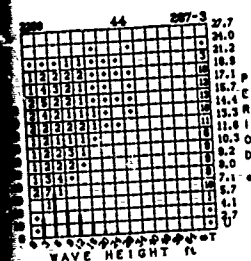
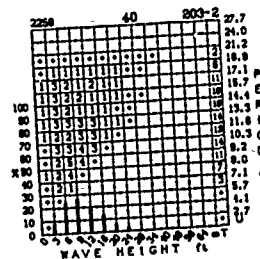
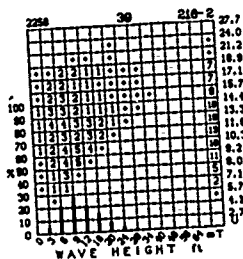
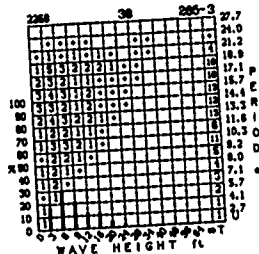
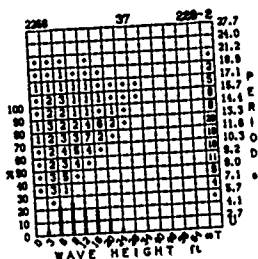


# WAVE HEIGHT AND PERIOD (Cont'd)

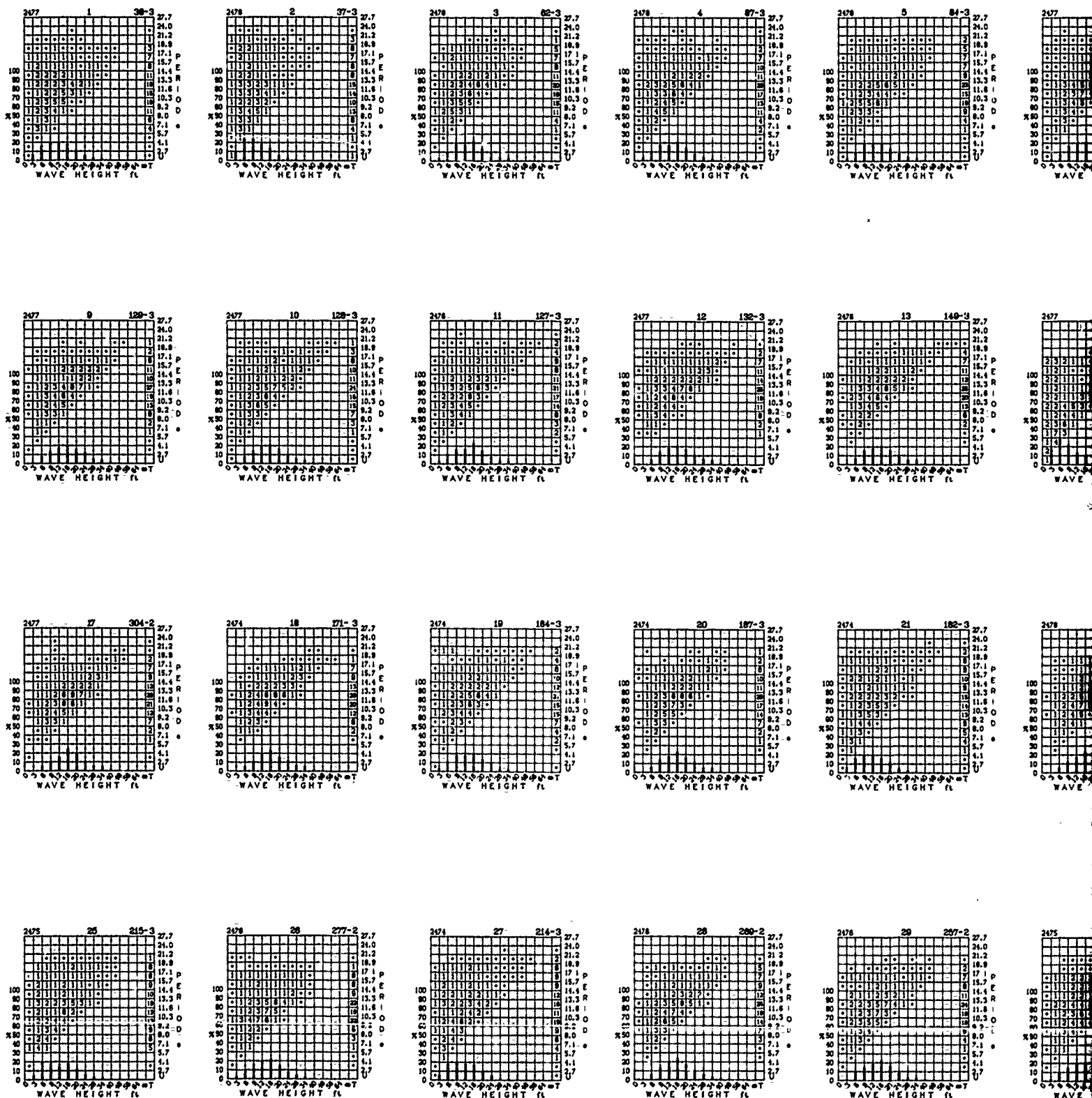




## FEBRUARY

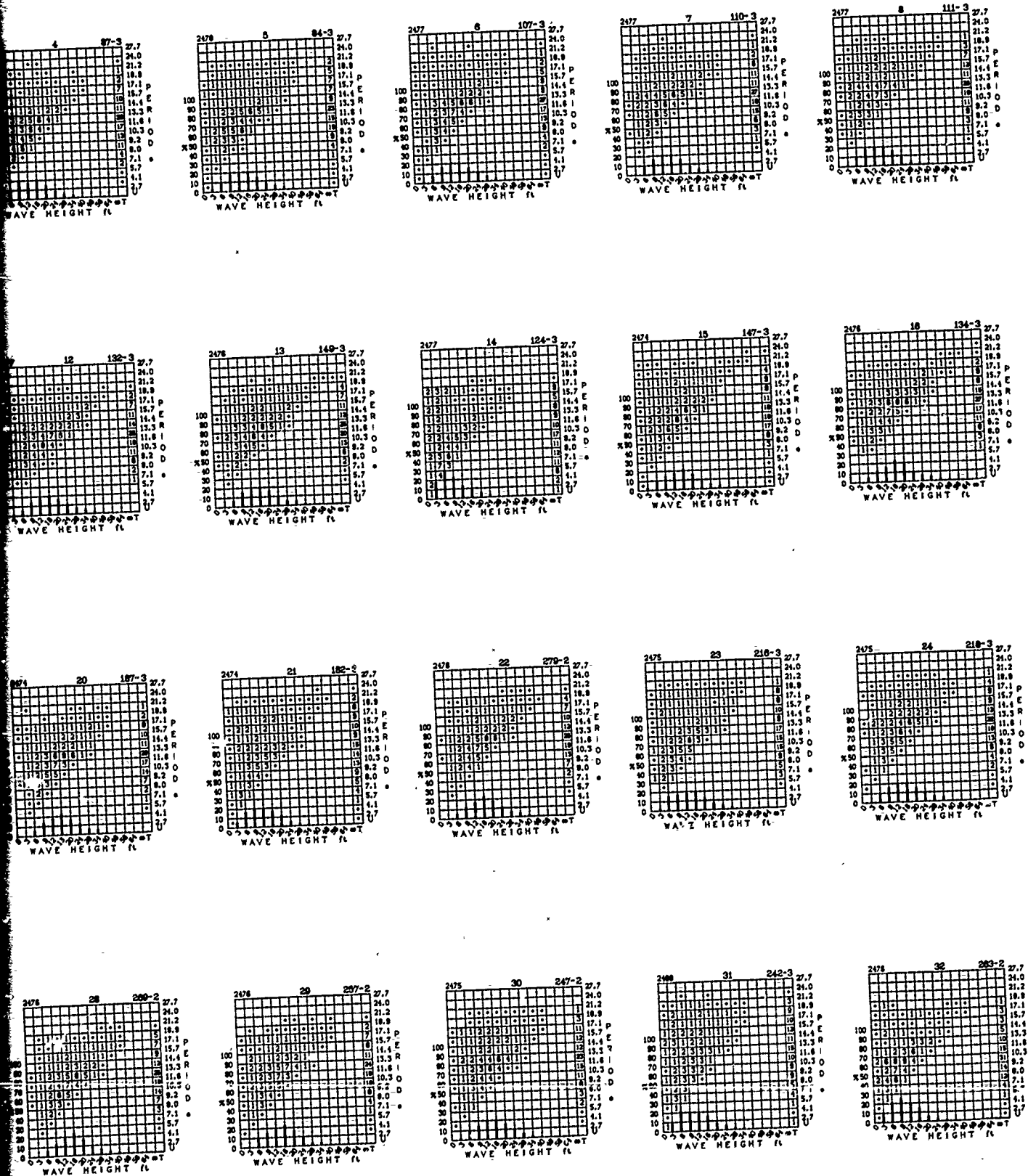


# MARCH

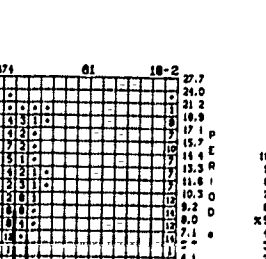
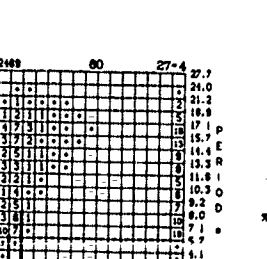
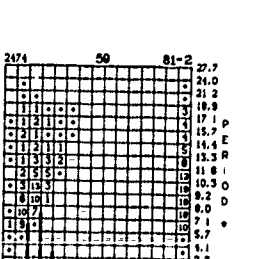
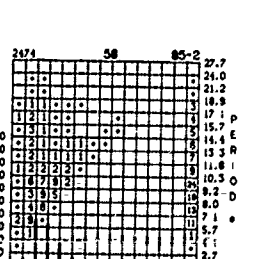
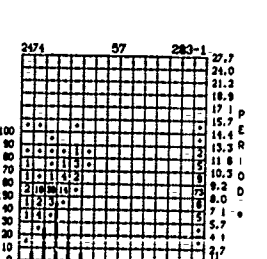
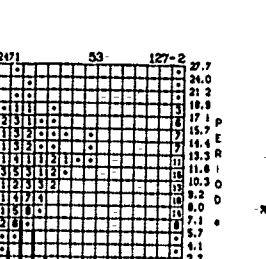
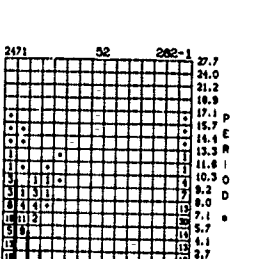
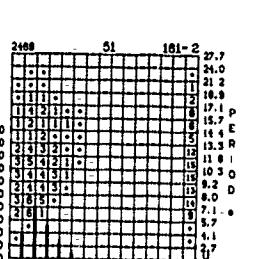
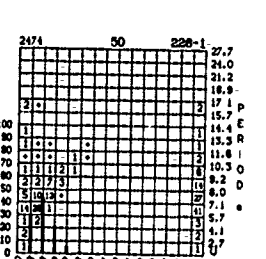
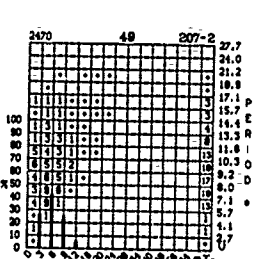
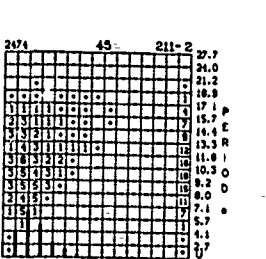
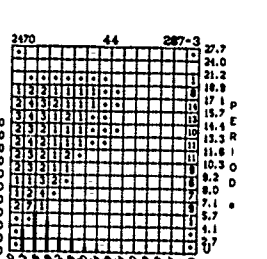
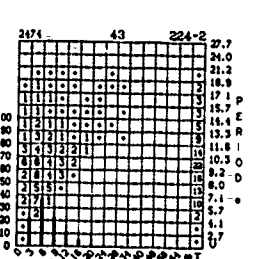
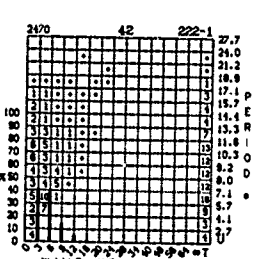
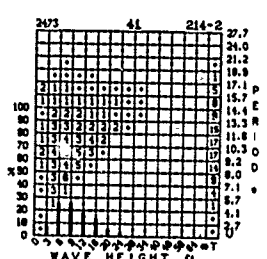
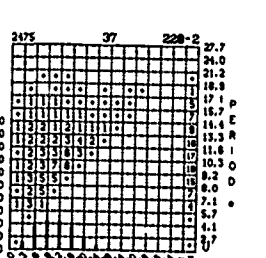
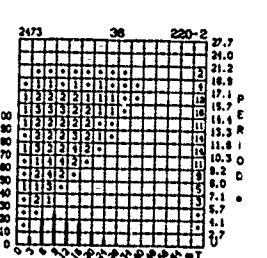
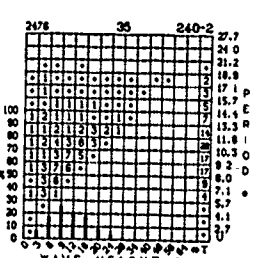
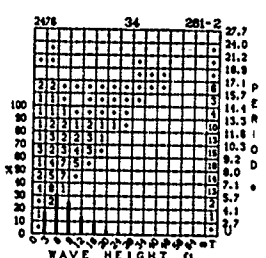
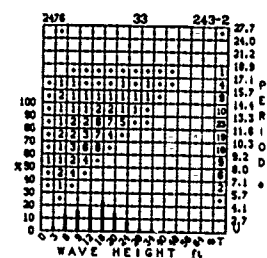




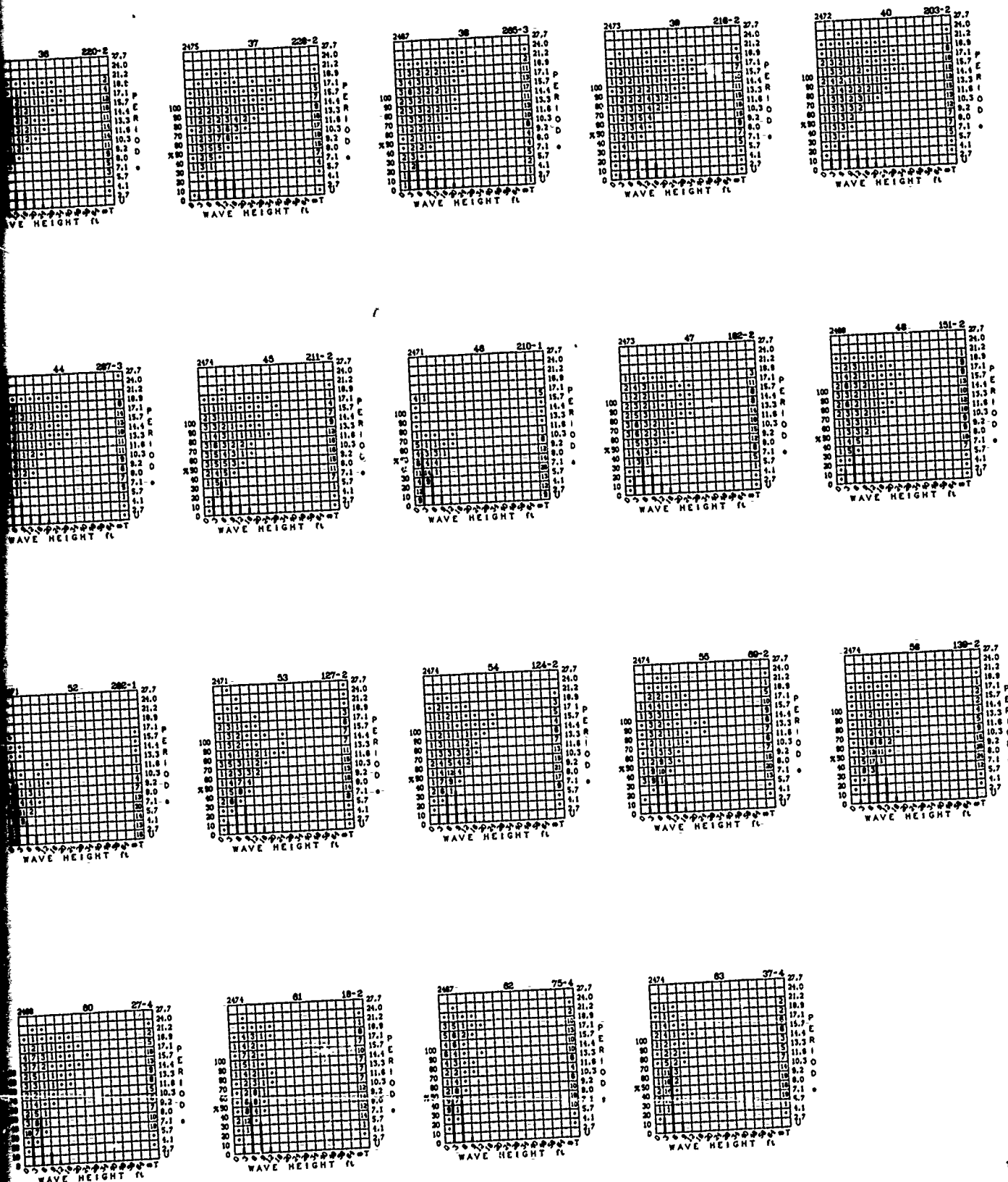
# WAVE HEIGHT AND PERIOD



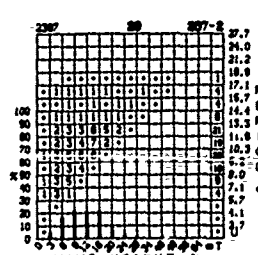
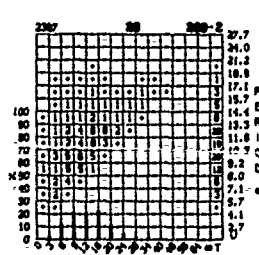
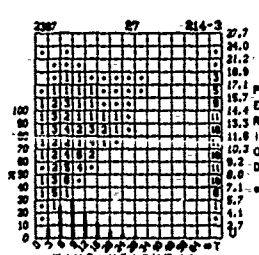
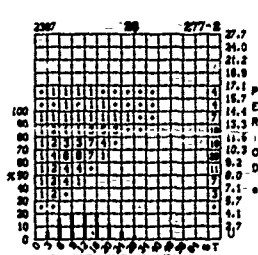
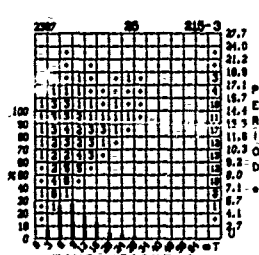
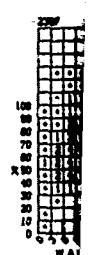
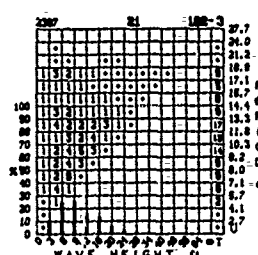
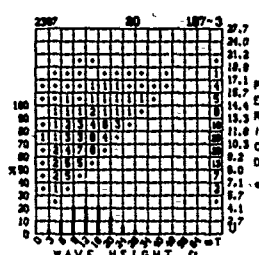
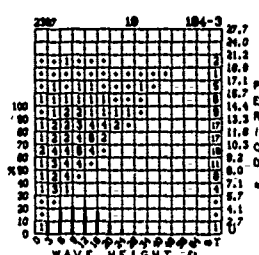
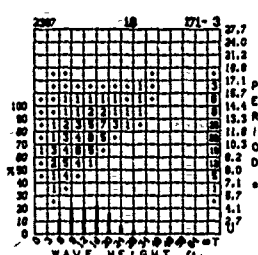
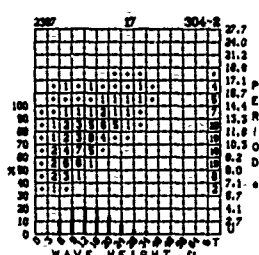
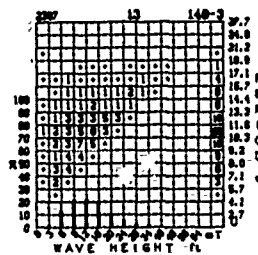
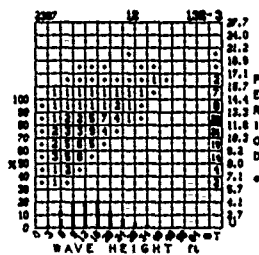
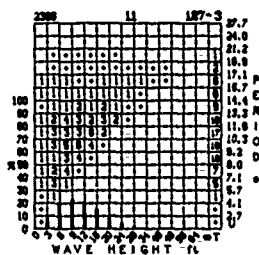
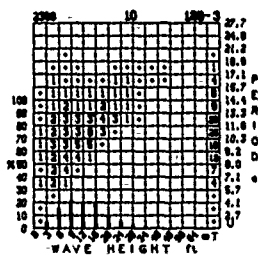
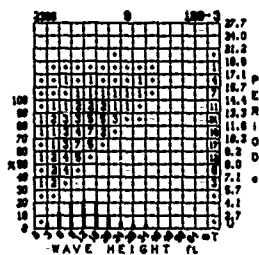
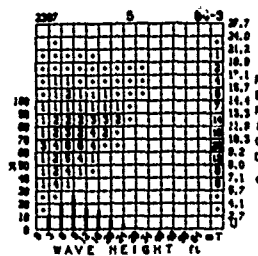
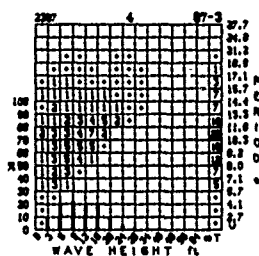
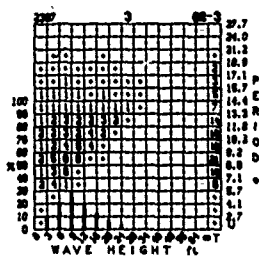
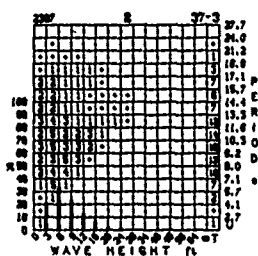
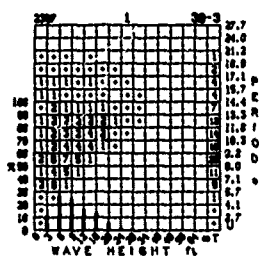
# WAVE HEIGHT AND PERIOD (Cont'd)



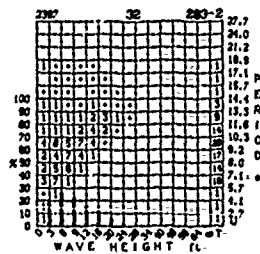
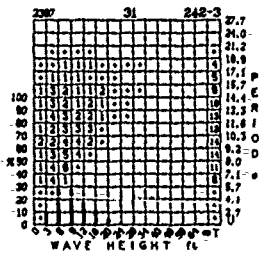
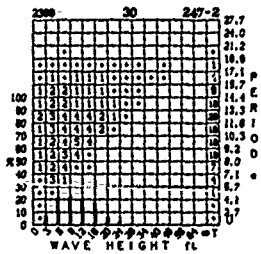
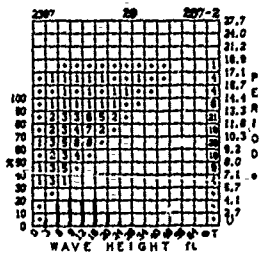
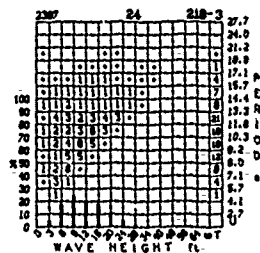
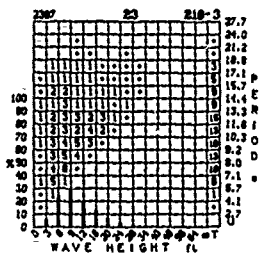
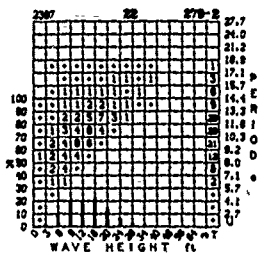
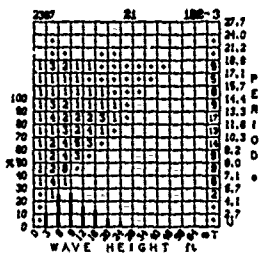
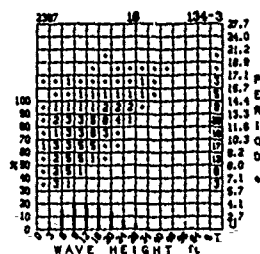
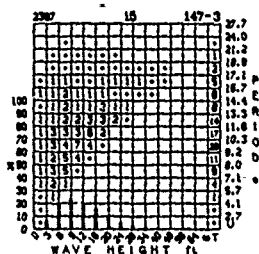
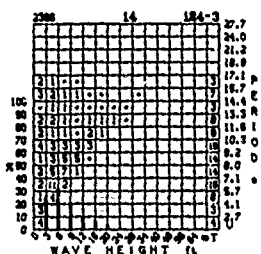
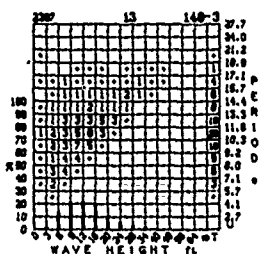
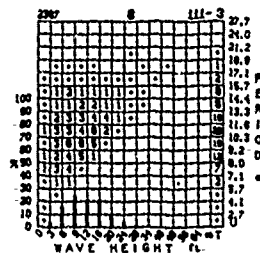
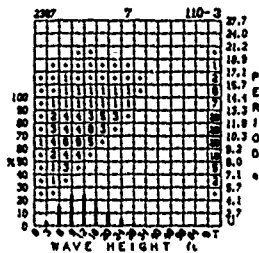
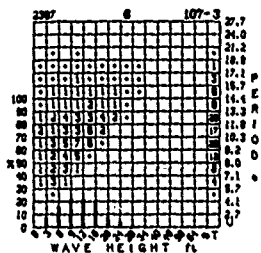
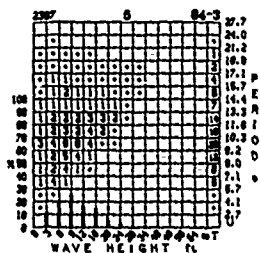
# MARCH



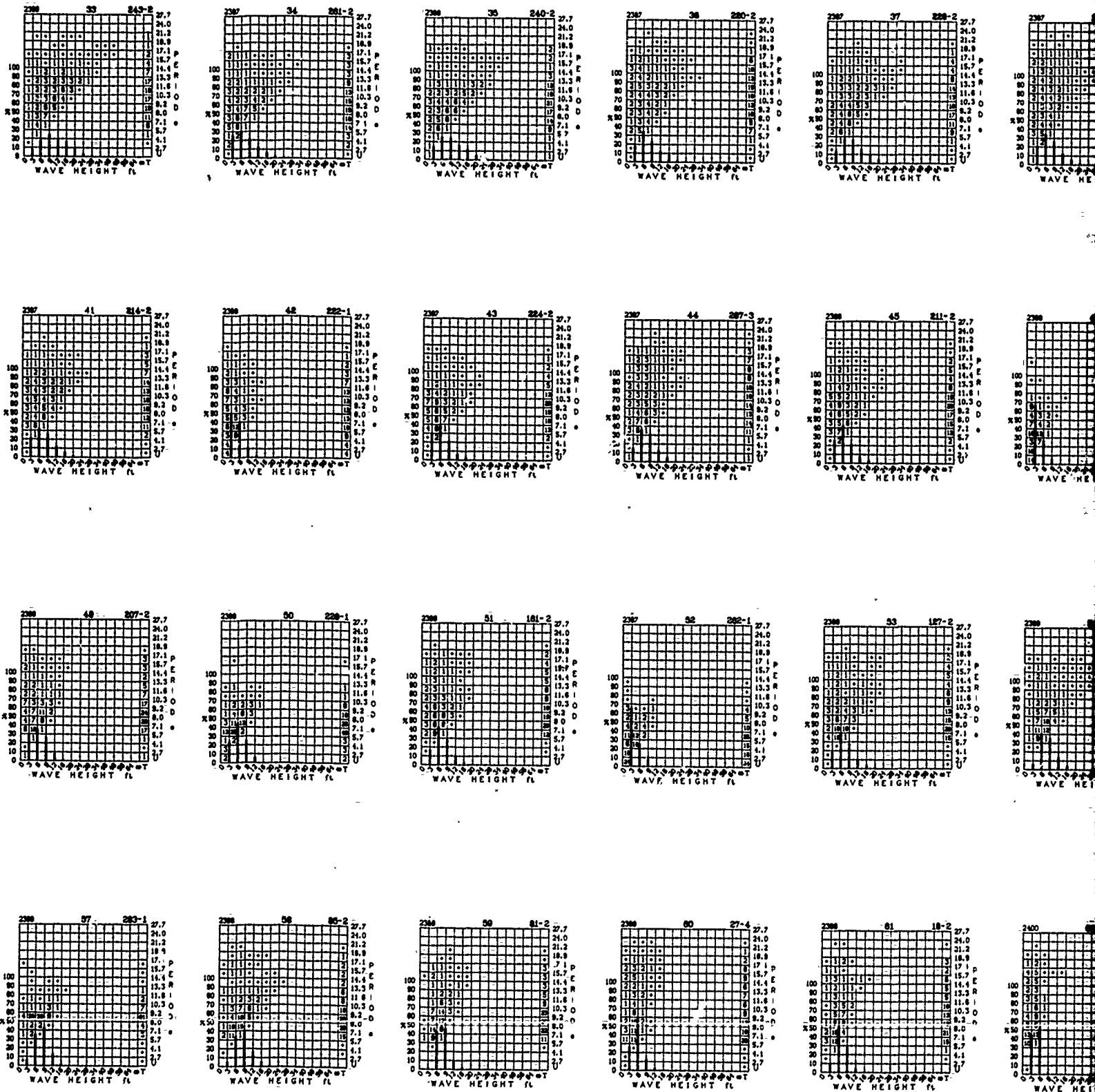
# APRIL



# WAVE HEIGHT AND PERIOD



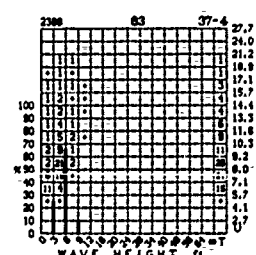
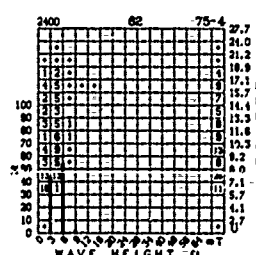
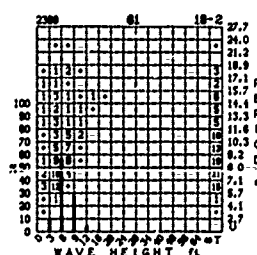
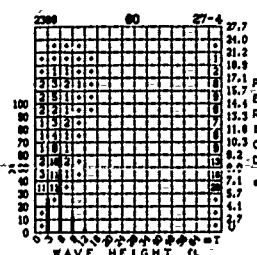
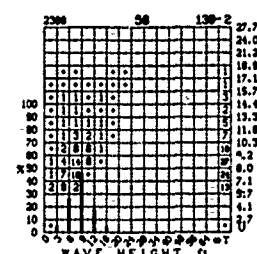
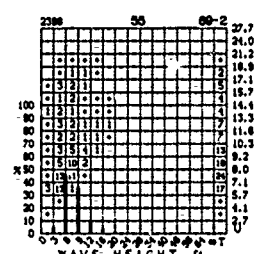
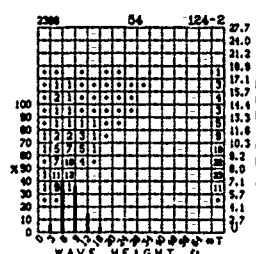
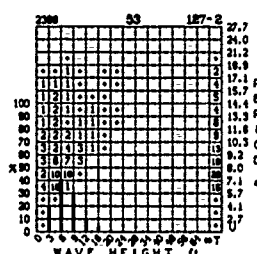
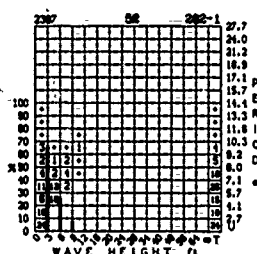
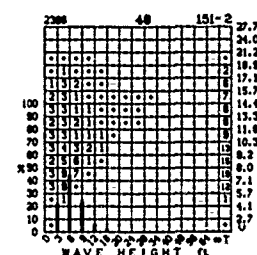
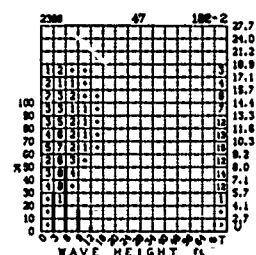
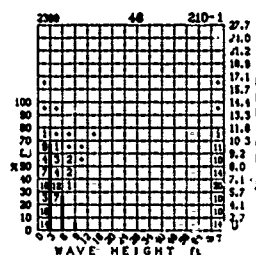
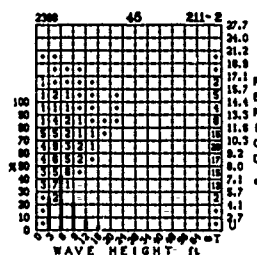
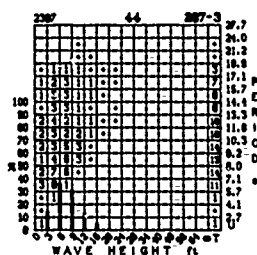
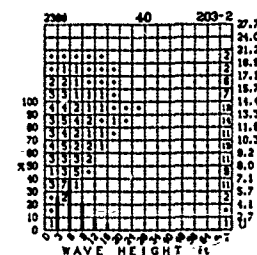
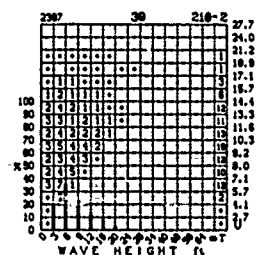
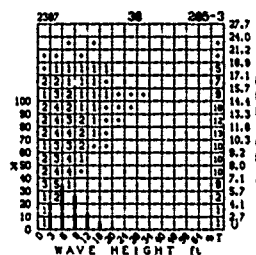
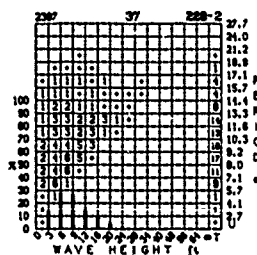
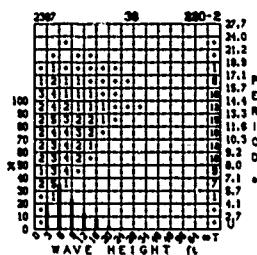
# WAVE HEIGHT AND PERIOD (Cont'd)





d)

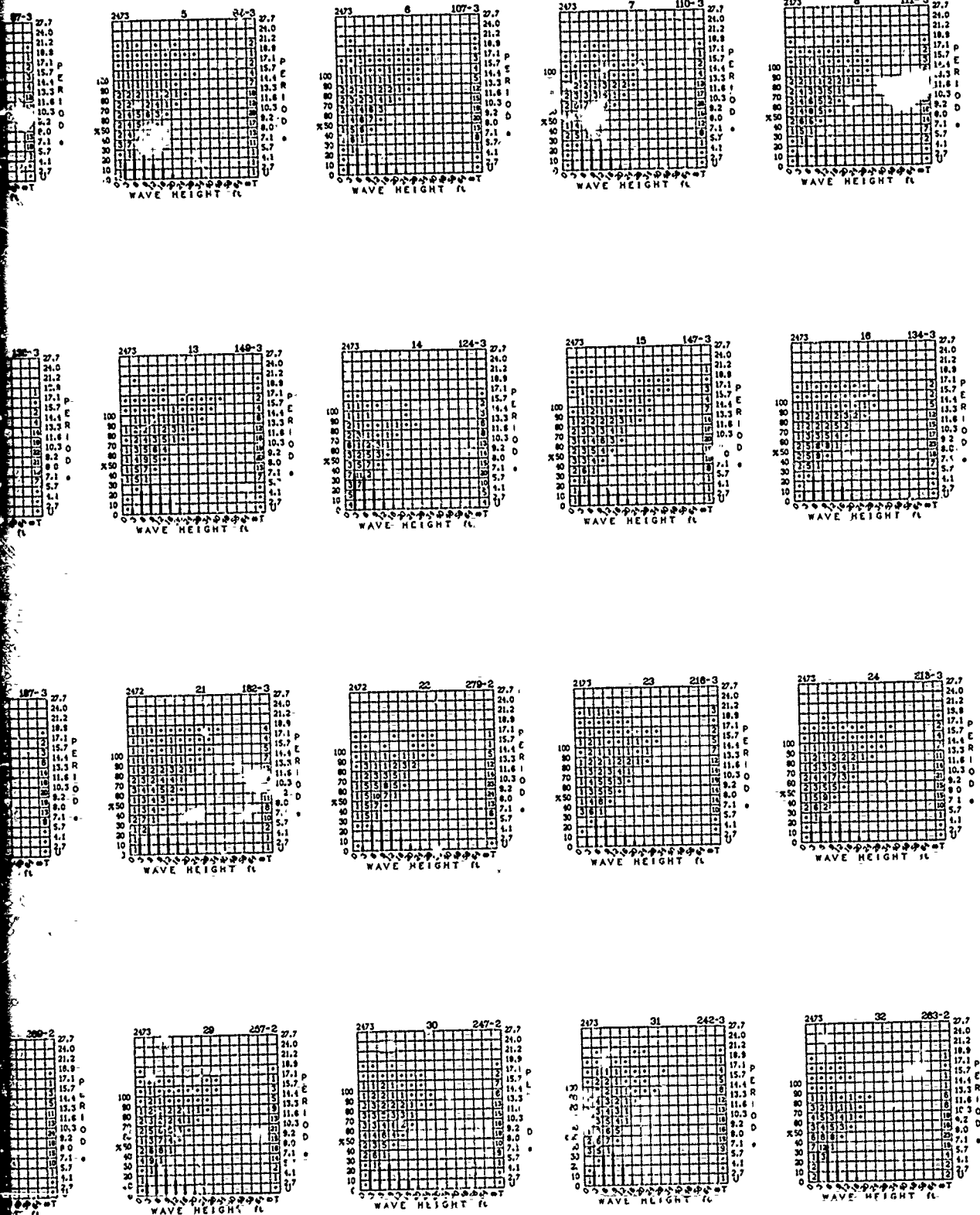
APRIL



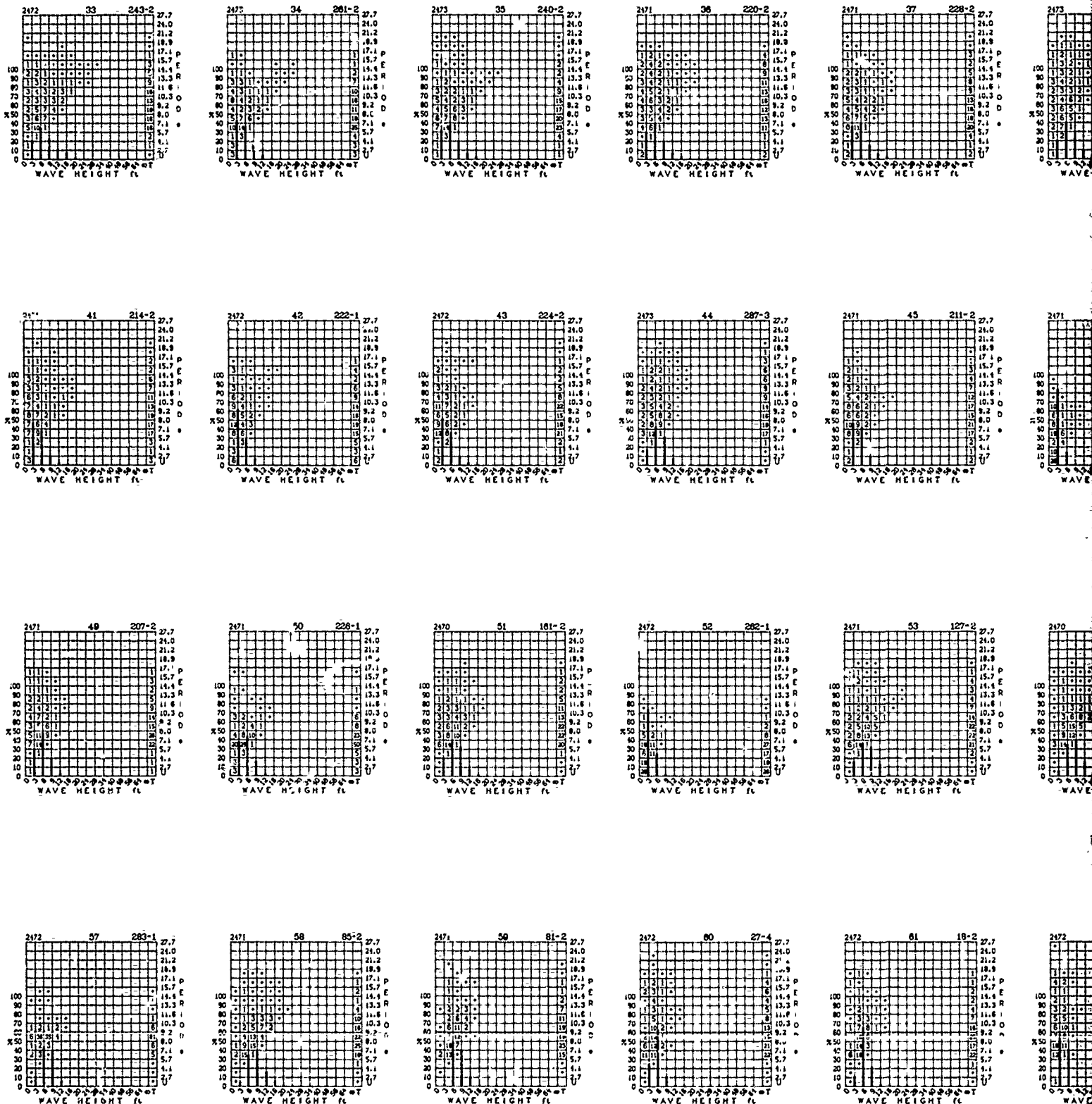




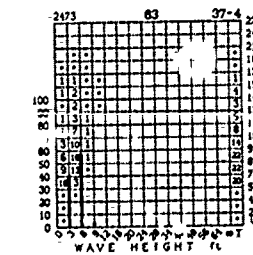
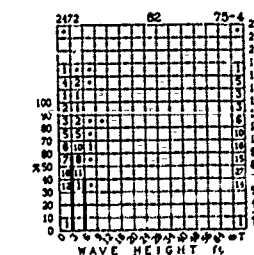
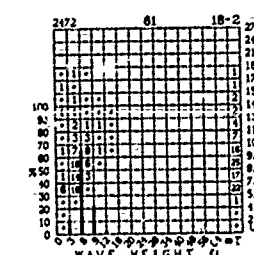
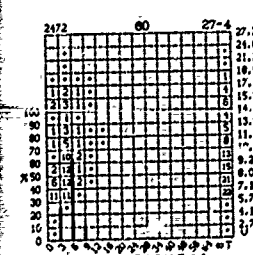
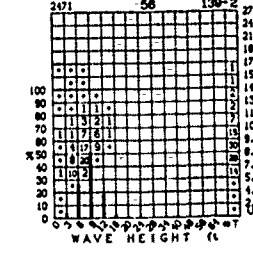
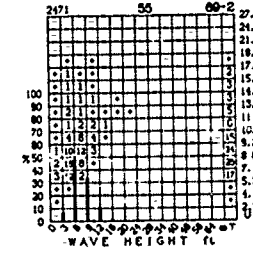
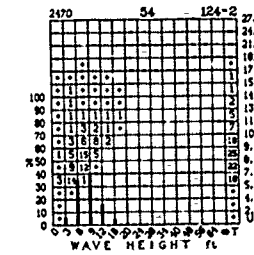
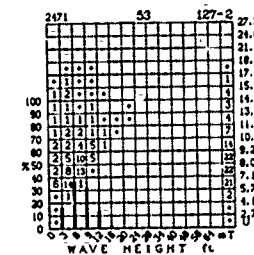
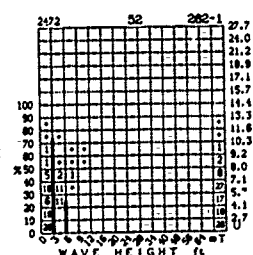
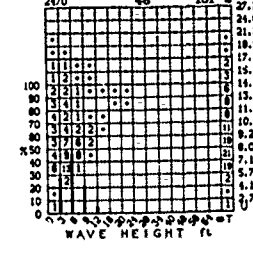
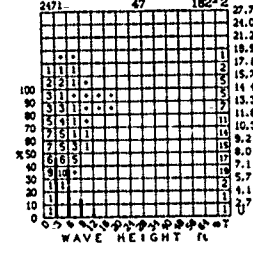
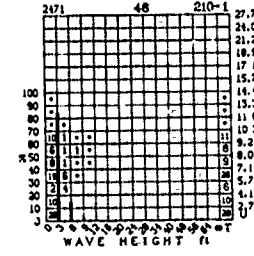
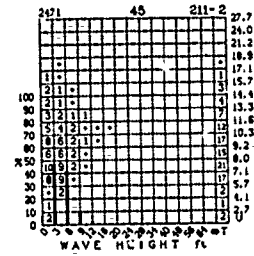
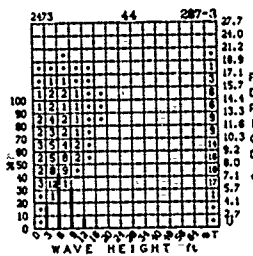
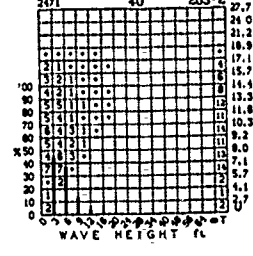
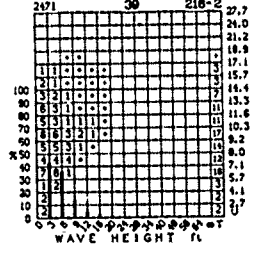
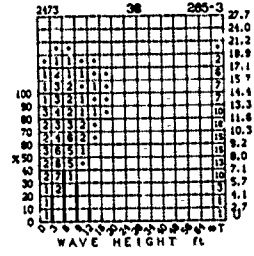
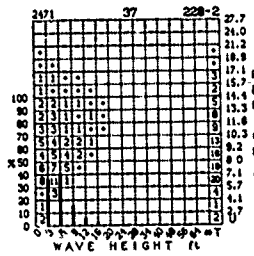
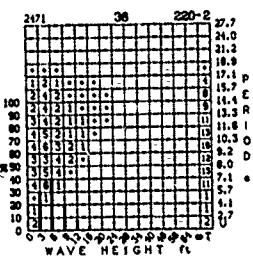
# WAVE HEIGHT AND PERIOD



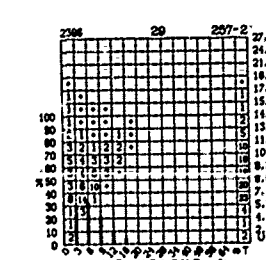
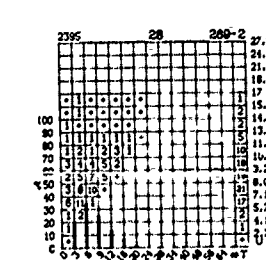
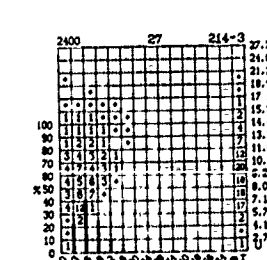
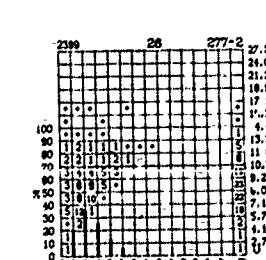
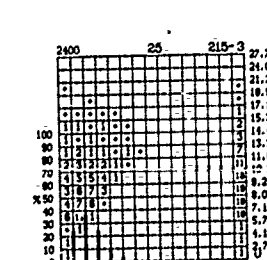
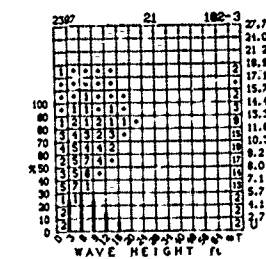
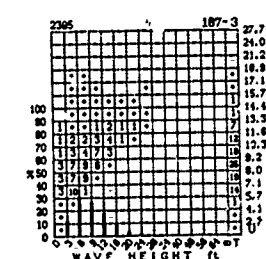
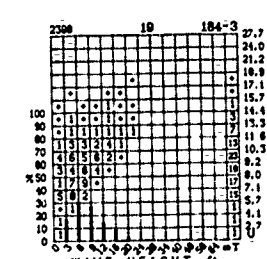
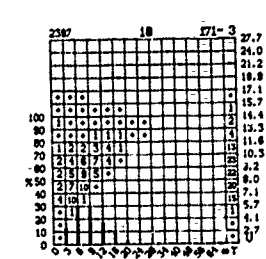
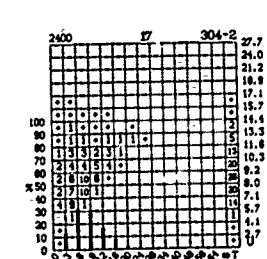
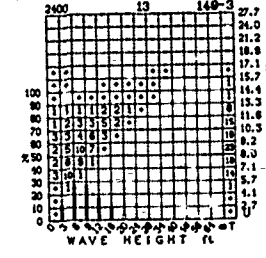
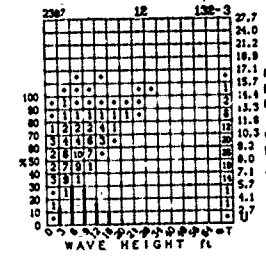
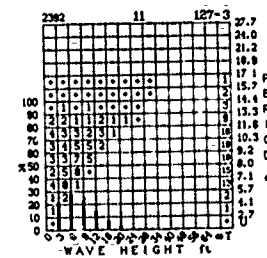
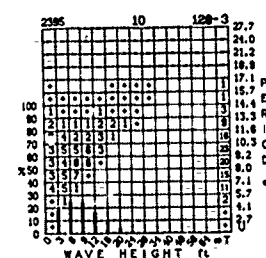
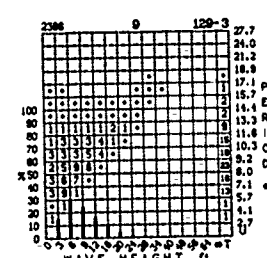
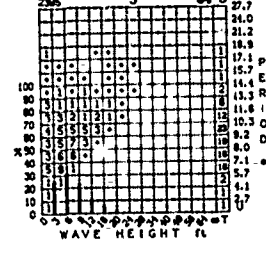
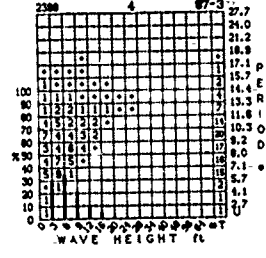
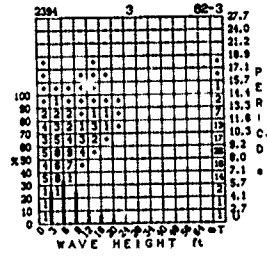
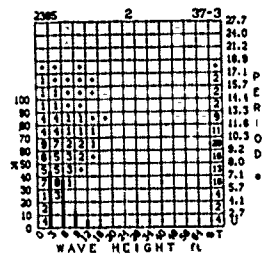
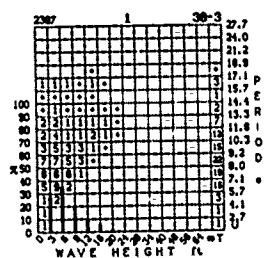
# WAVE HEIGHT AND PERIOD (Cont'd)



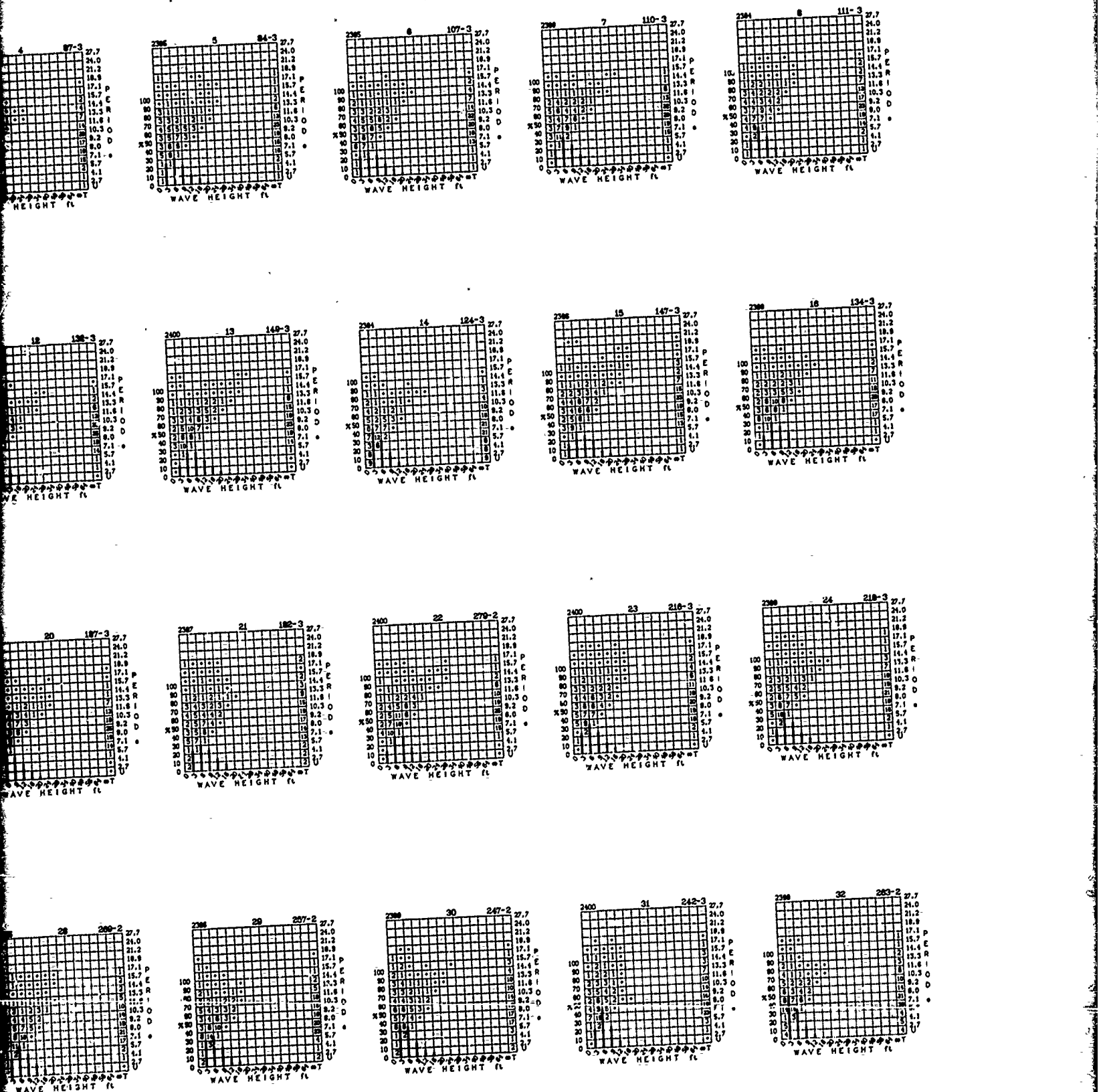
MAY



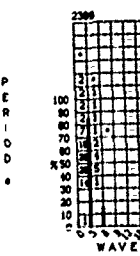
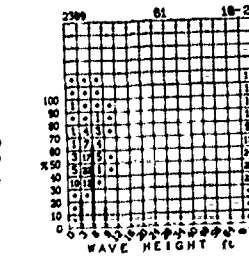
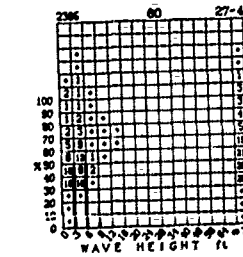
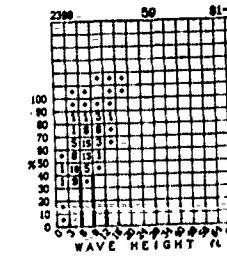
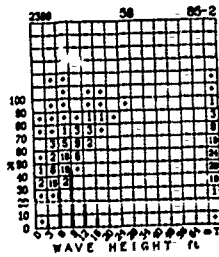
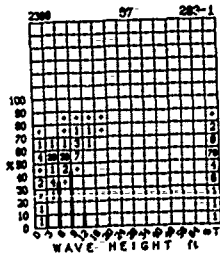
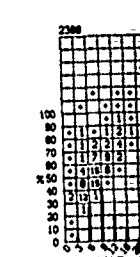
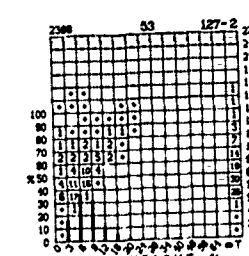
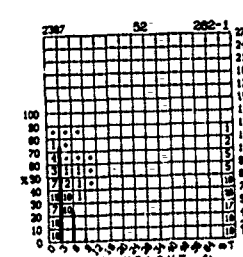
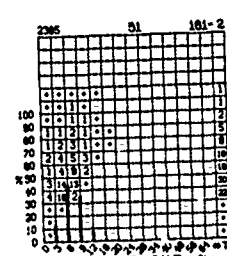
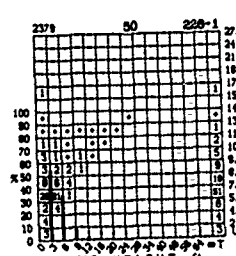
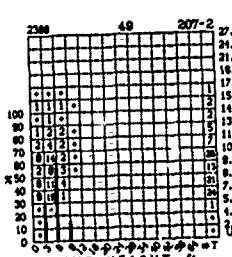
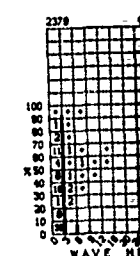
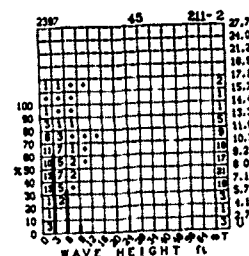
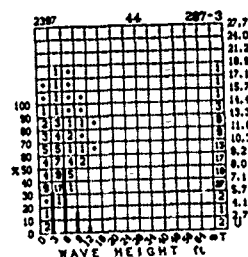
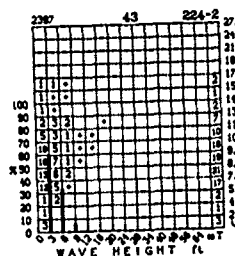
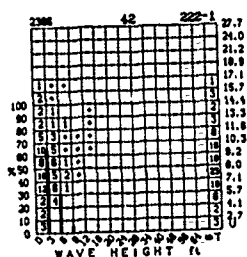
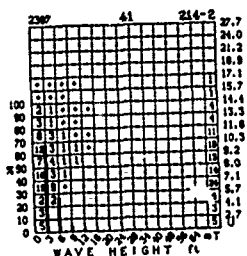
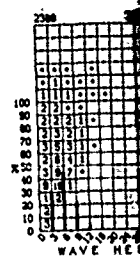
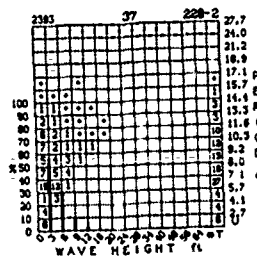
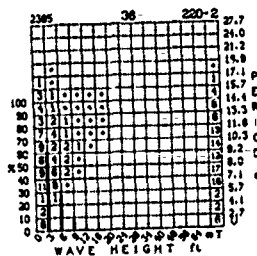
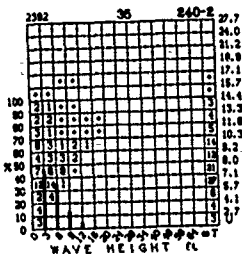
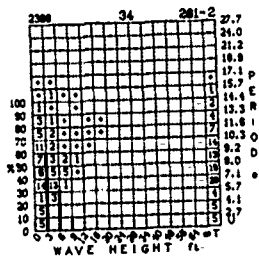
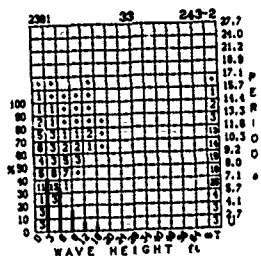
# JUNE



# WAVE HEIGHT AND PERIOD

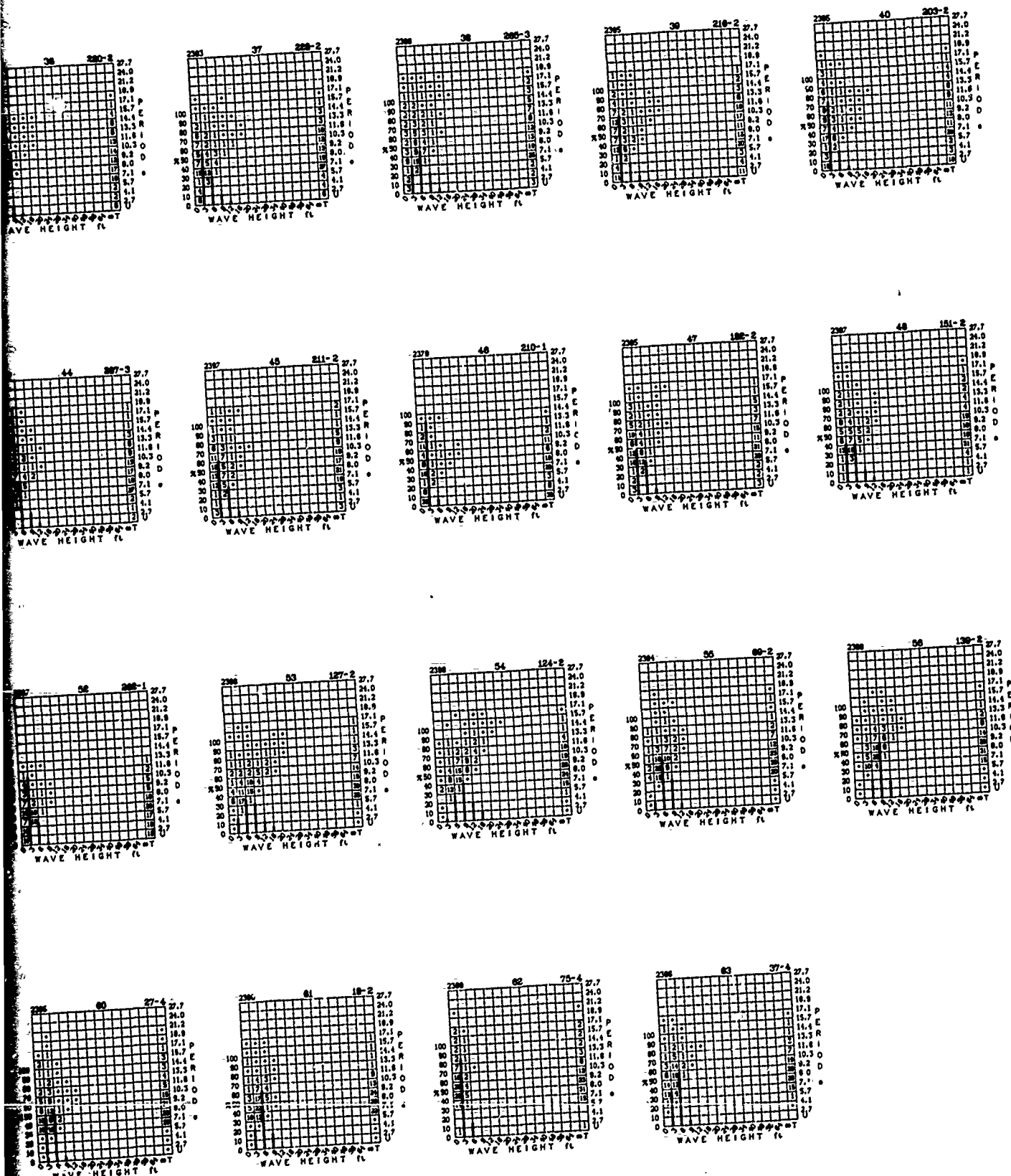


# WAVE HEIGHT AND PERIOD (Cont'd)



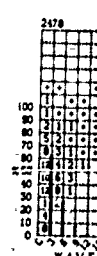
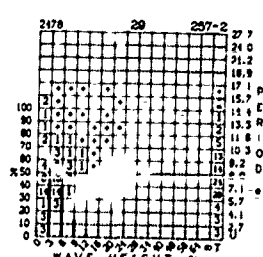
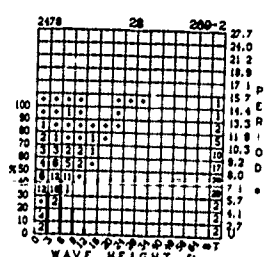
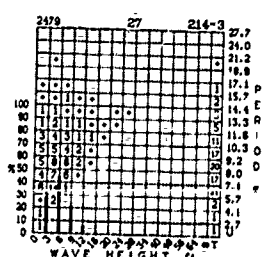
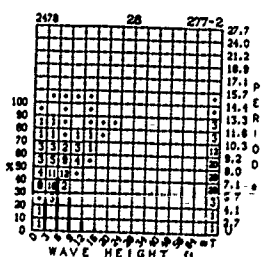
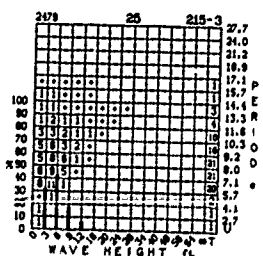
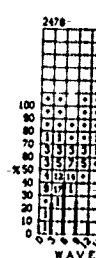
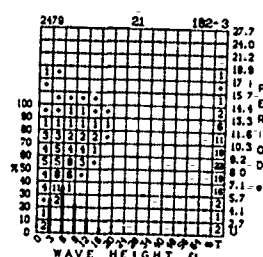
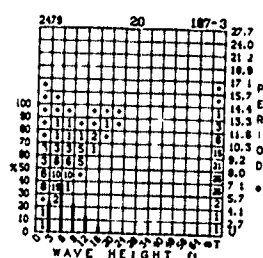
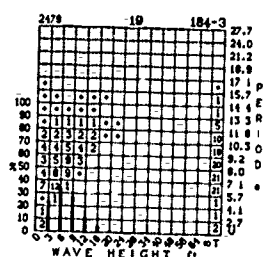
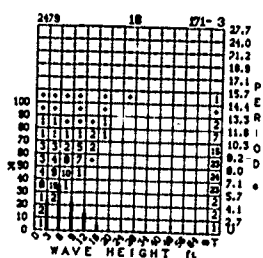
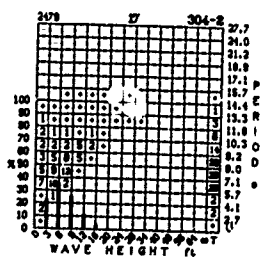
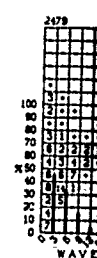
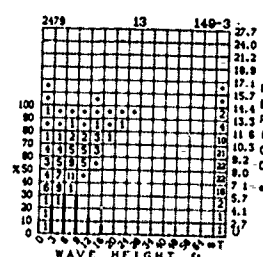
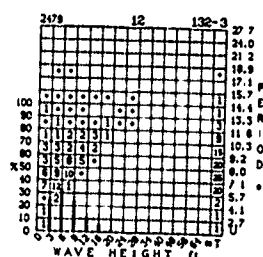
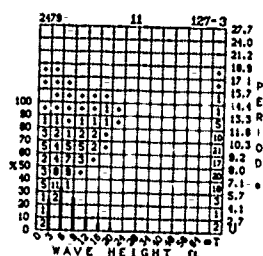
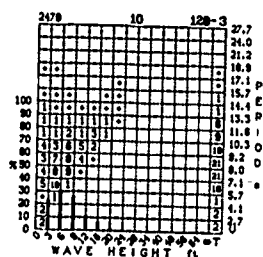
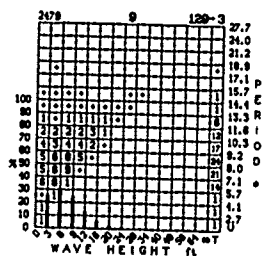
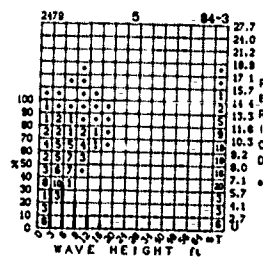
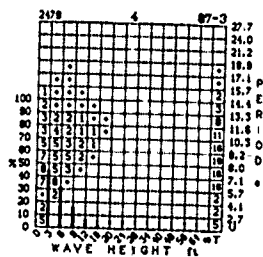
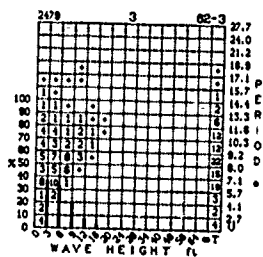
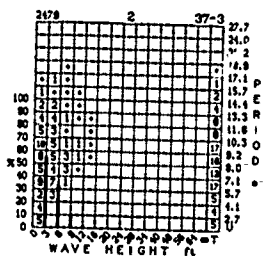
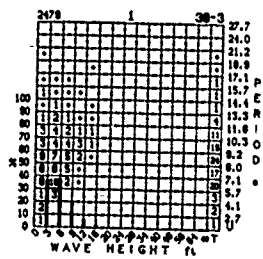


# JUNE

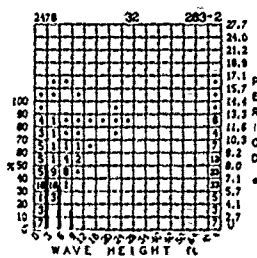
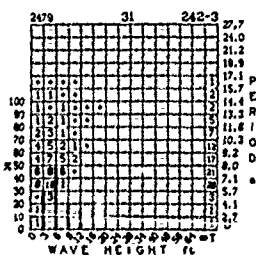
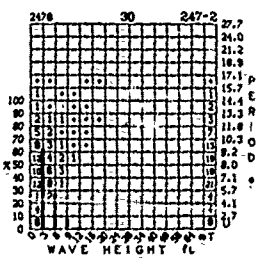
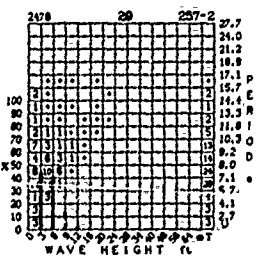
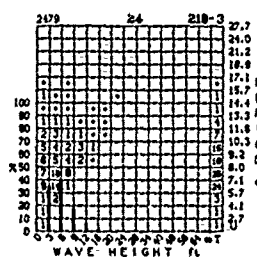
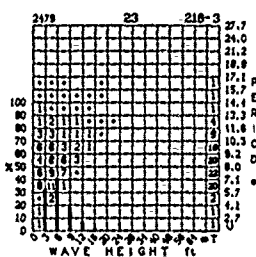
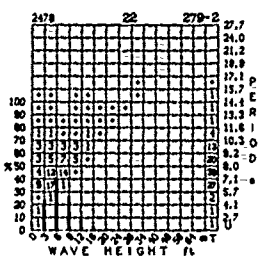
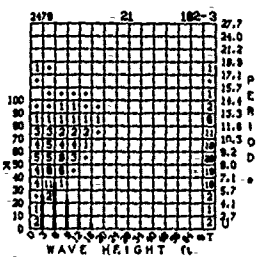
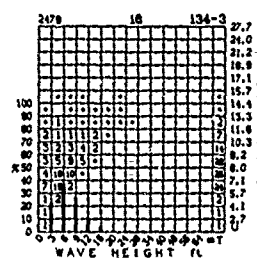
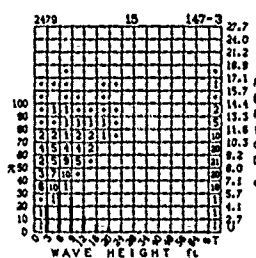
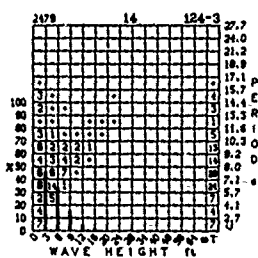
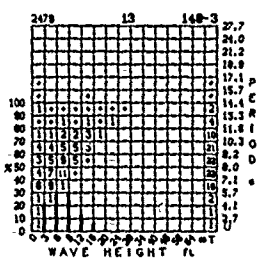
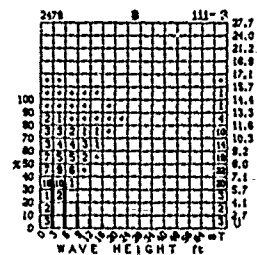
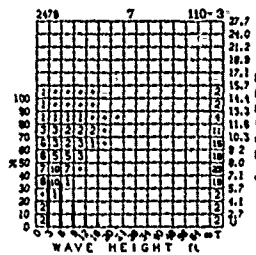
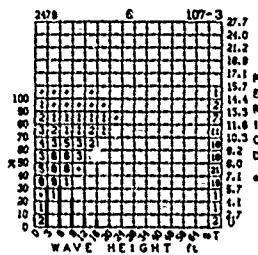
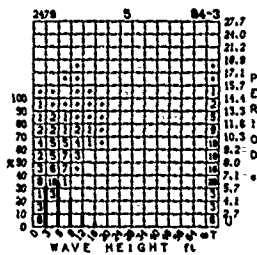




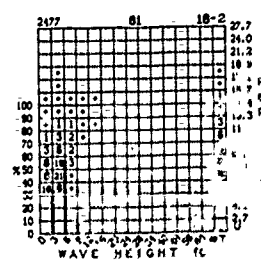
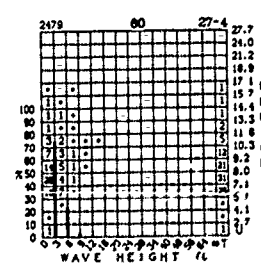
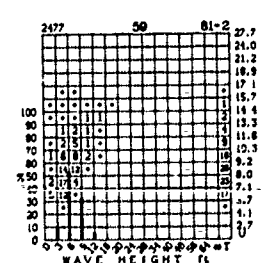
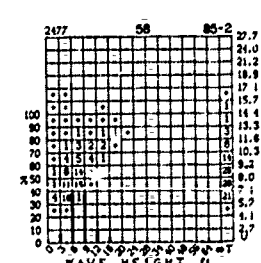
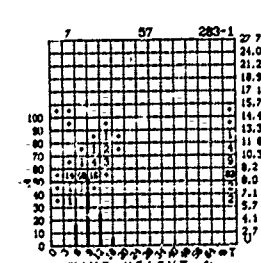
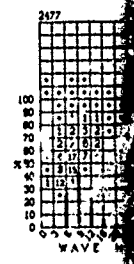
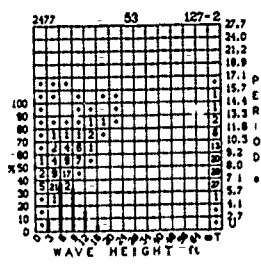
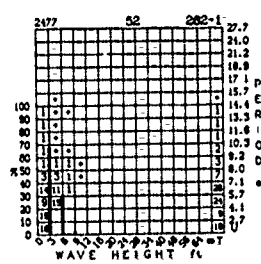
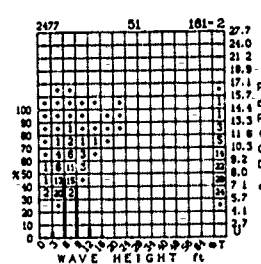
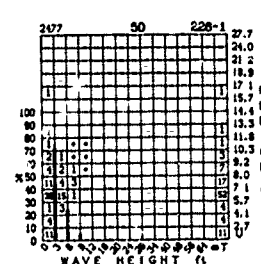
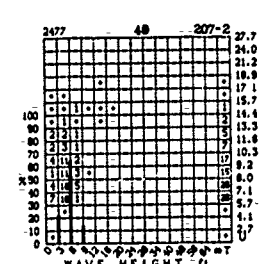
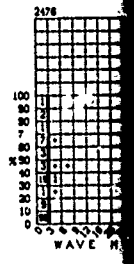
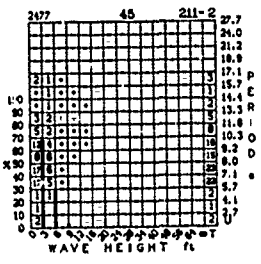
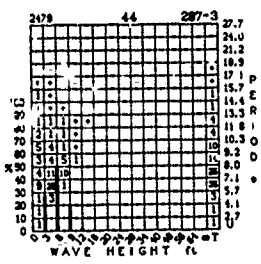
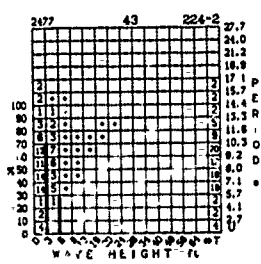
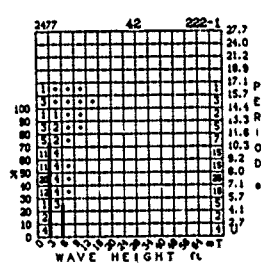
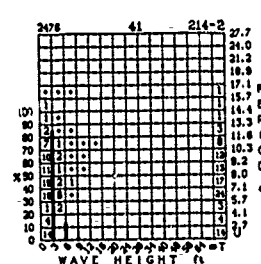
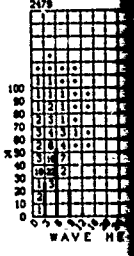
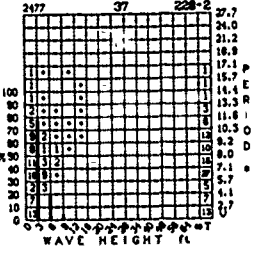
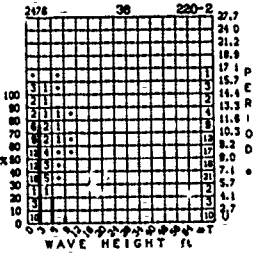
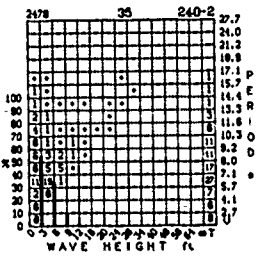
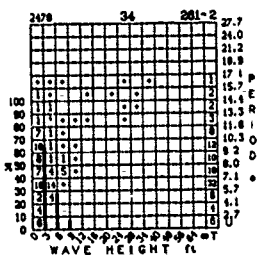
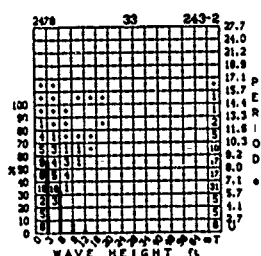
# JULY



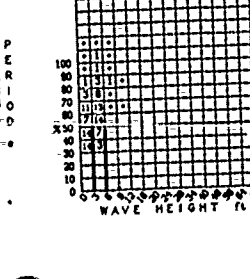
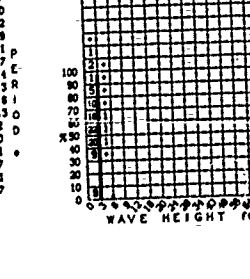
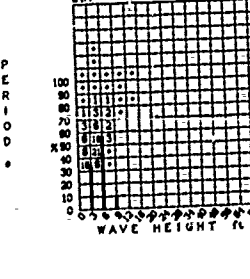
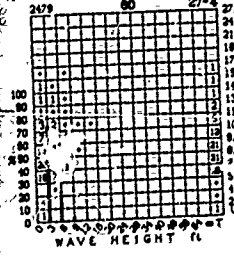
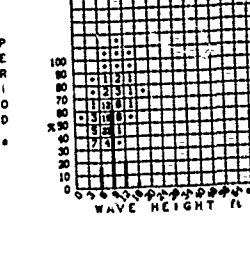
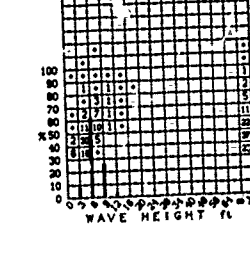
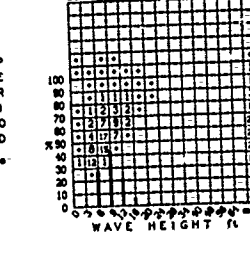
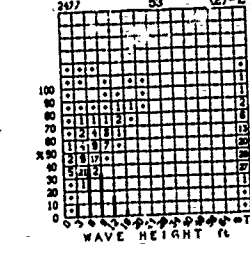
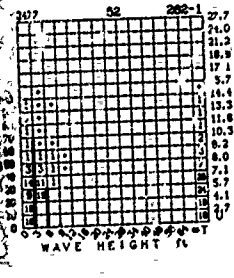
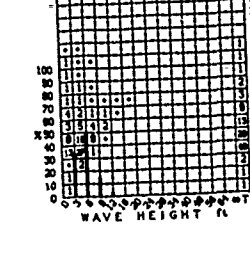
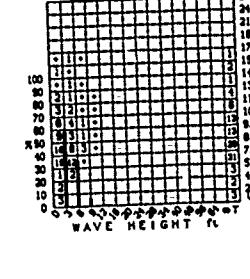
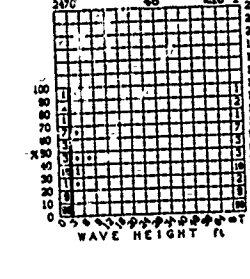
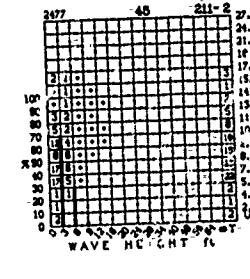
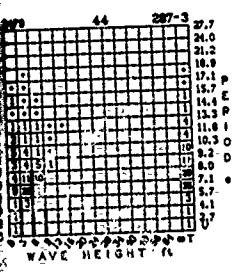
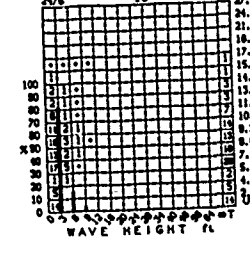
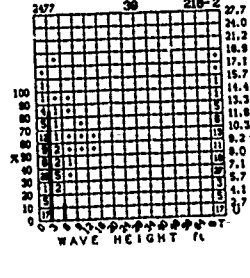
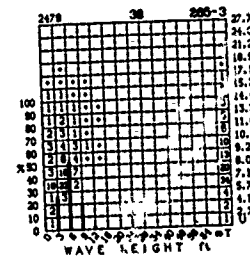
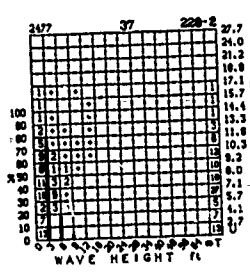
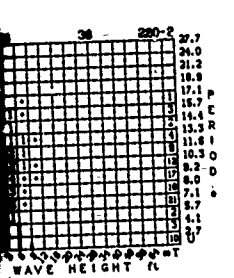
# WAVE HEIGHT AND PERIOD



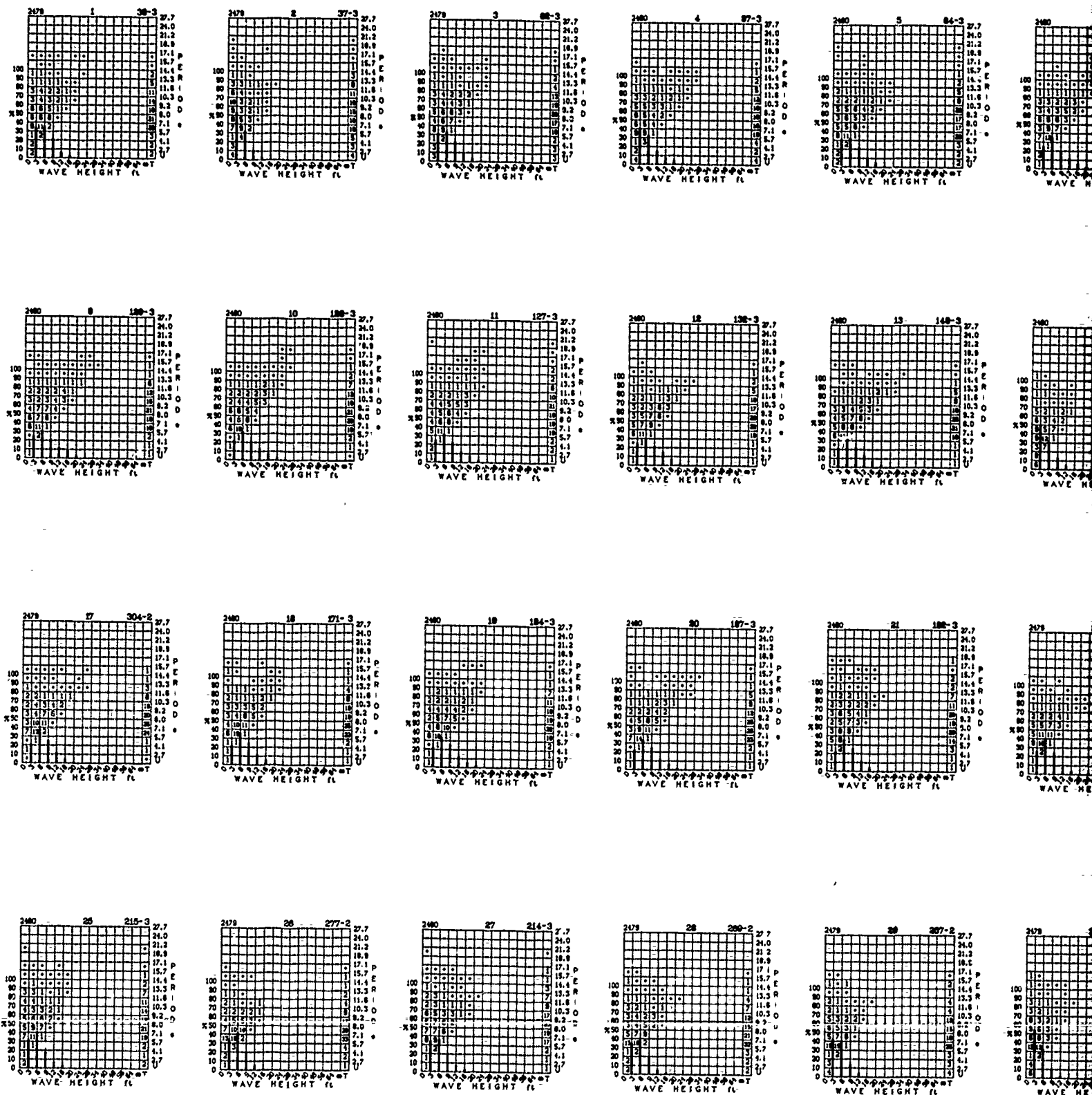
# WAVE HEIGHT AND PERIOD (Cont'd)



# JULY

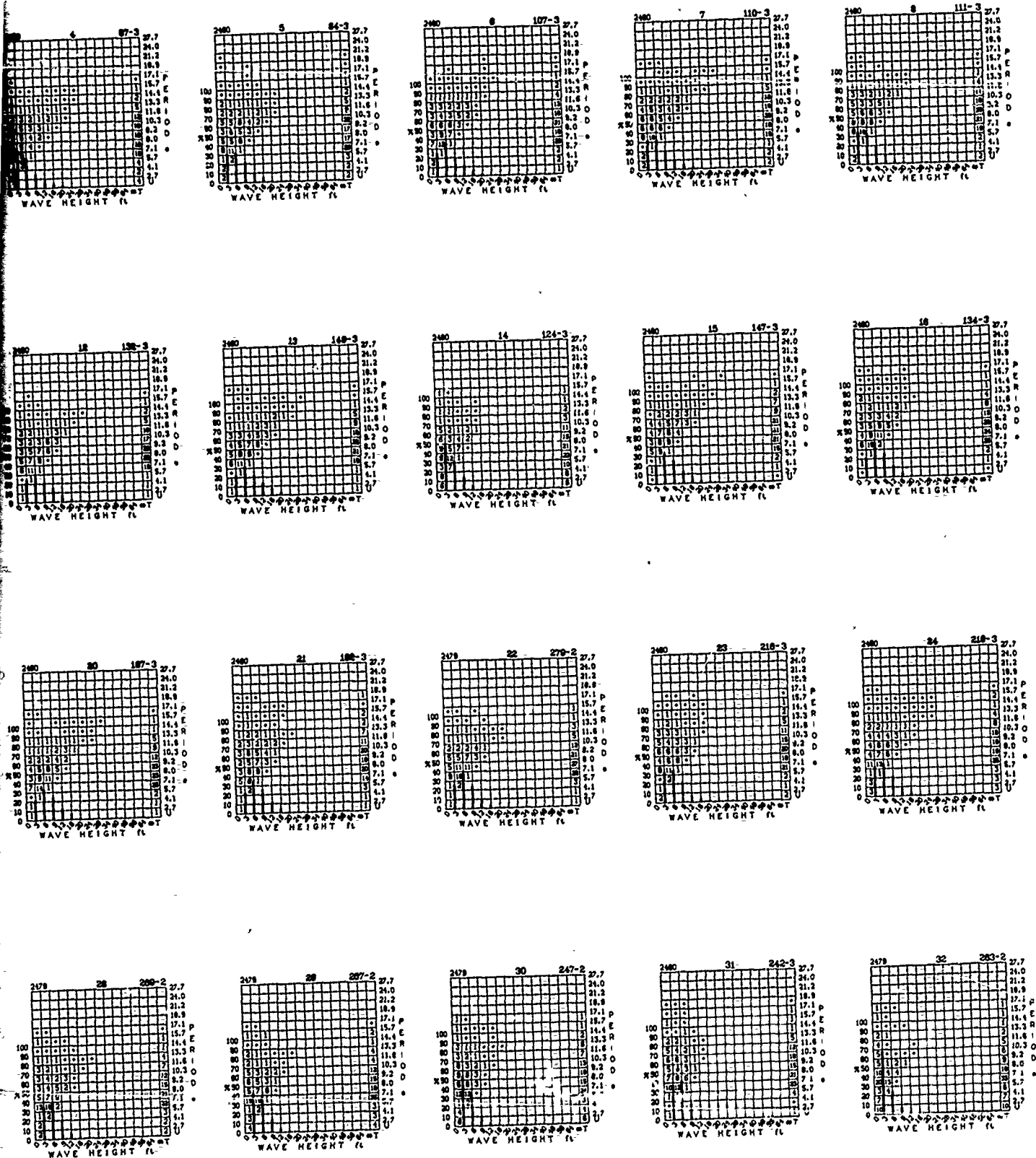


# AUGUST



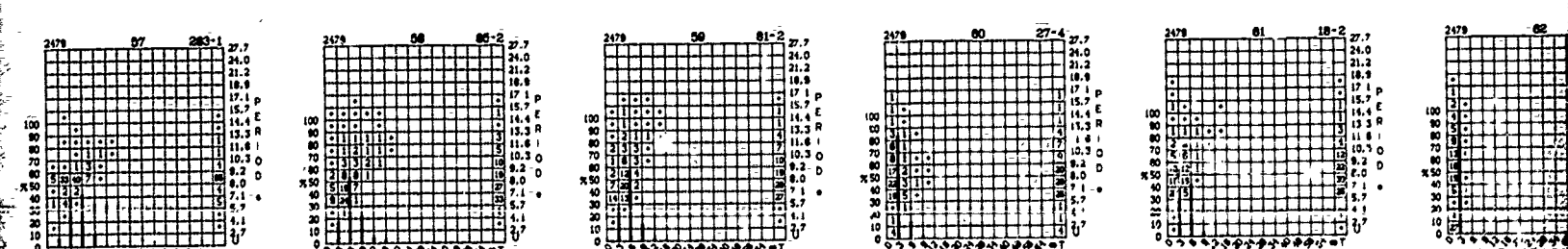
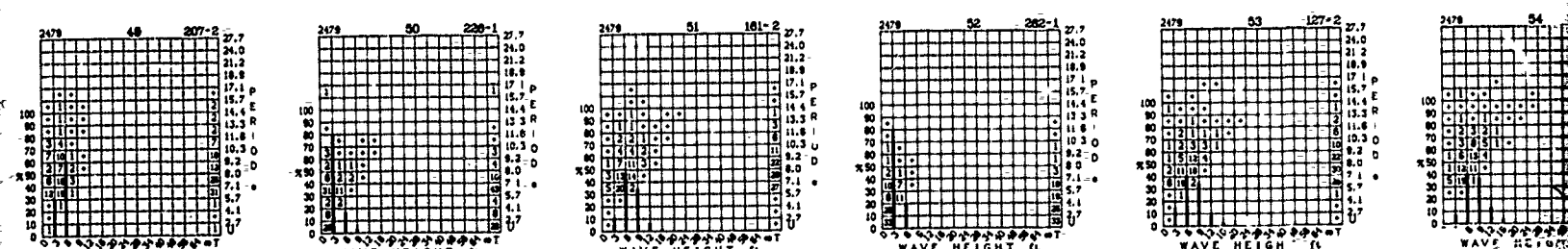
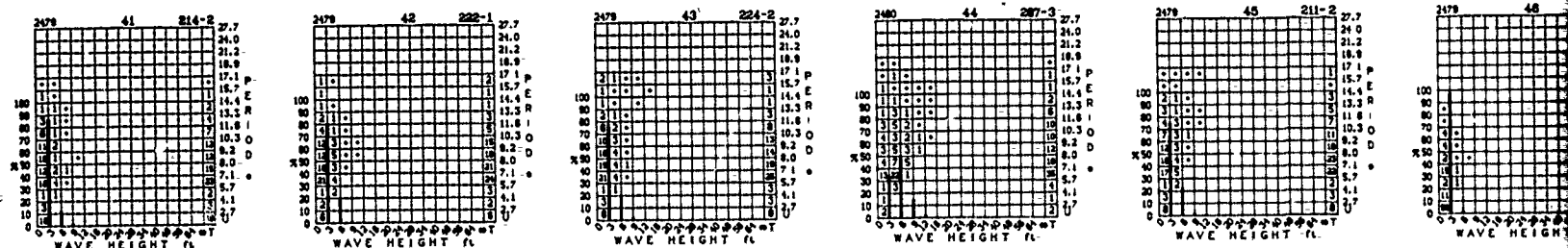
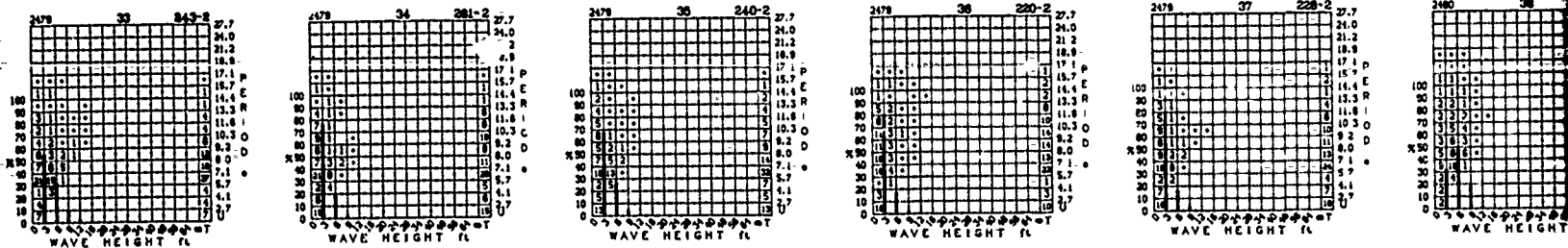
①

# WAVE HEIGHT AND PERIOD





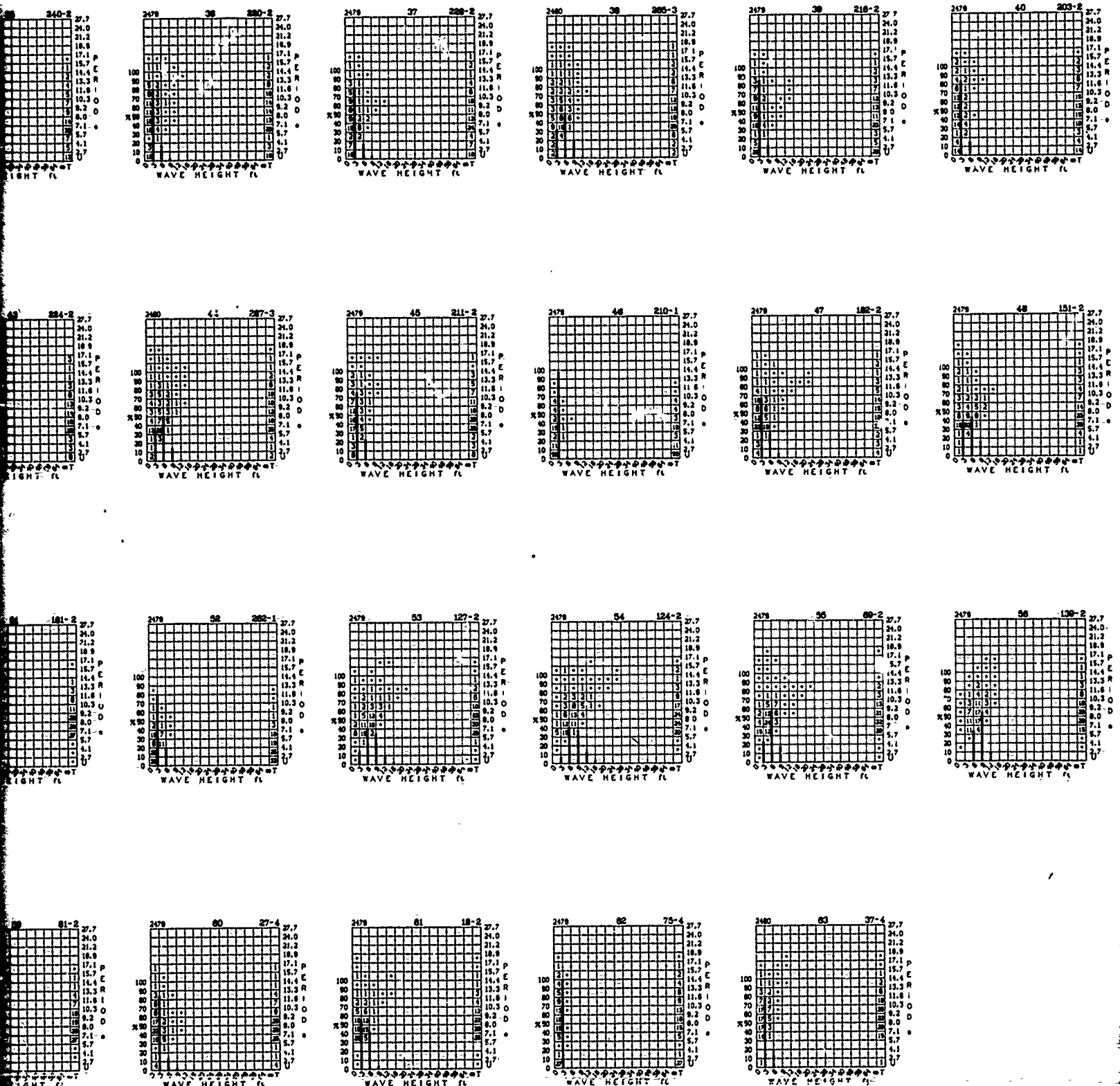
# WAVE HEIGHT AND PERIOD (Cont'd)





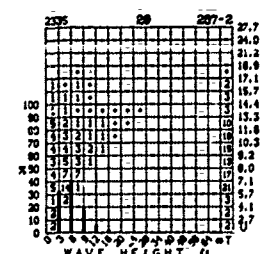
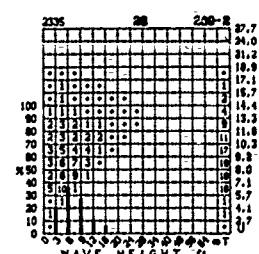
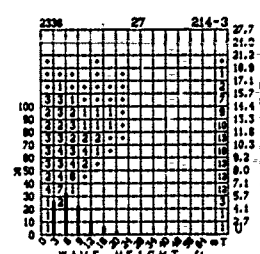
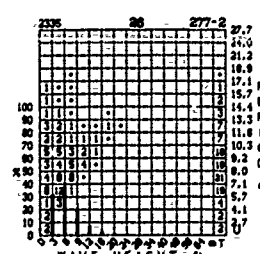
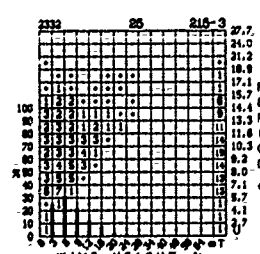
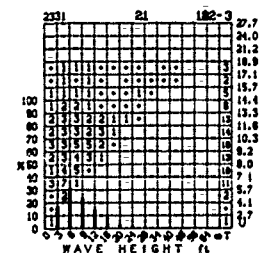
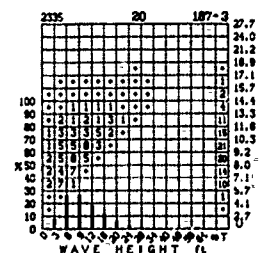
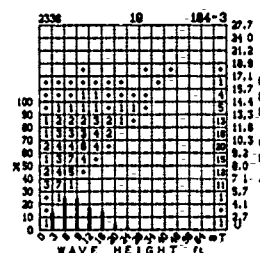
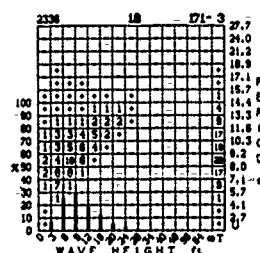
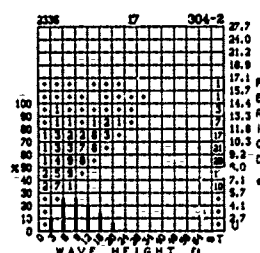
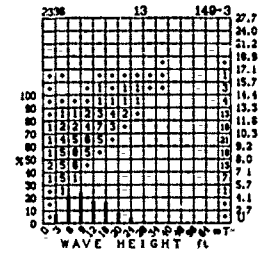
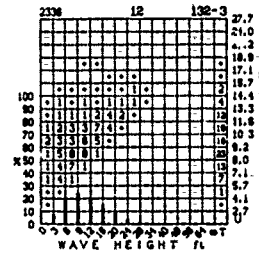
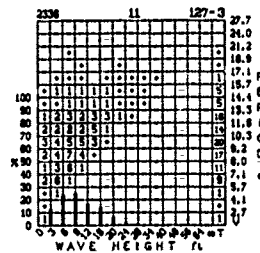
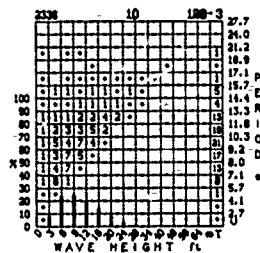
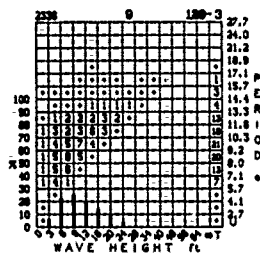
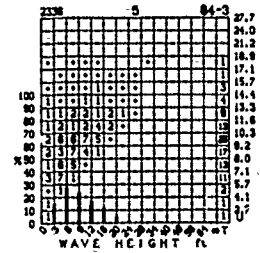
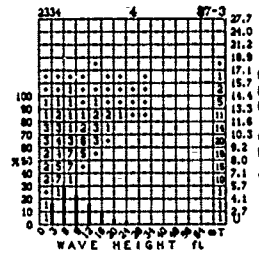
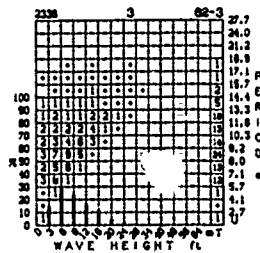
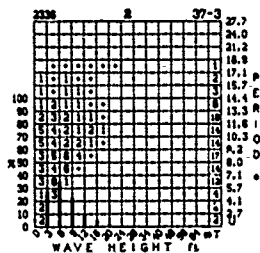
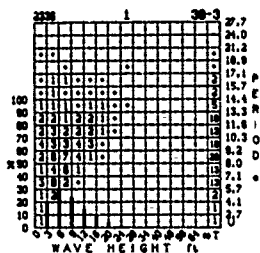
(Cont'd)

AUGUST



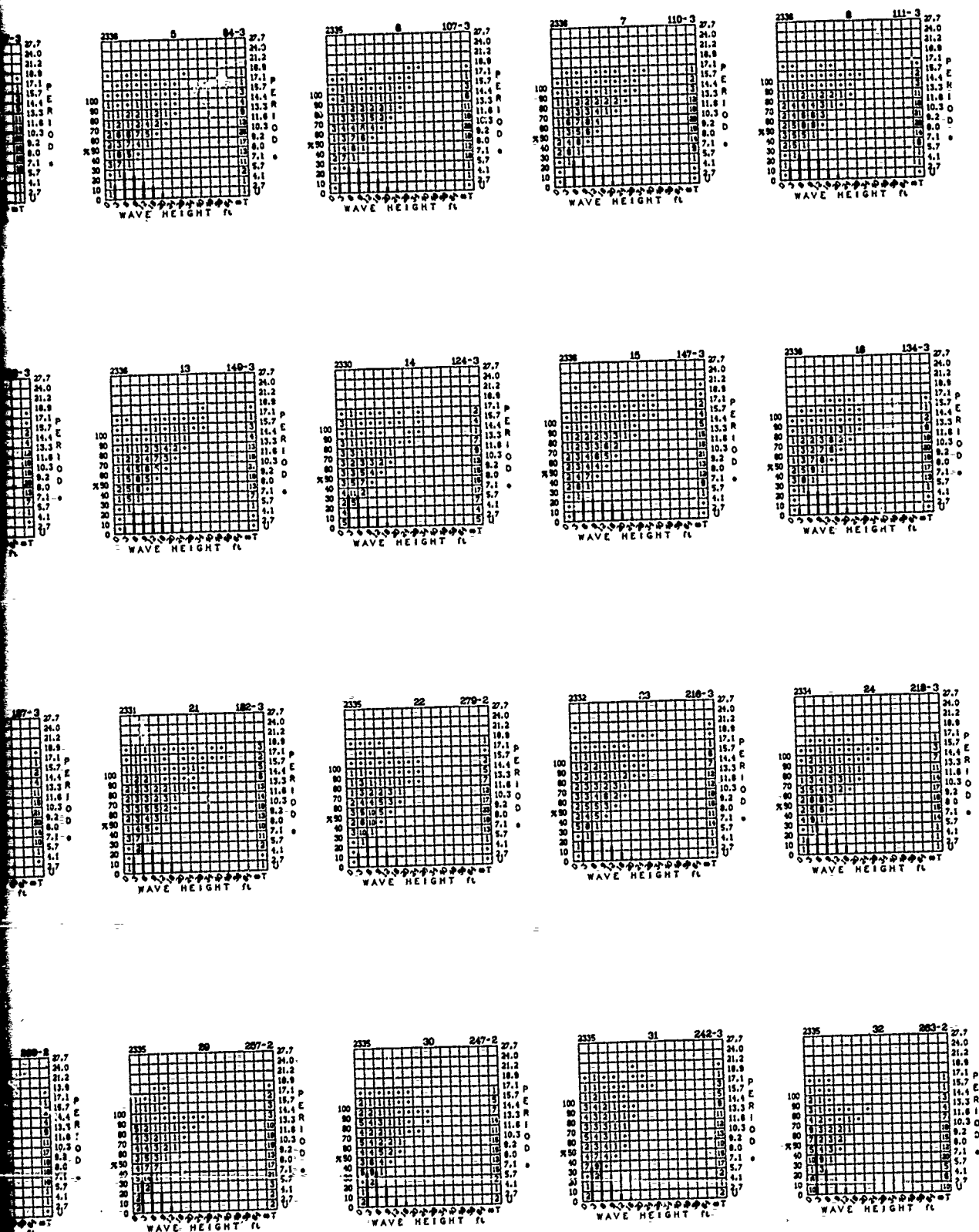
2

# SEPTEMBER

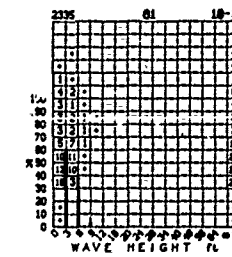
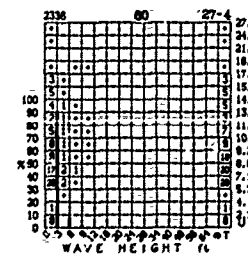
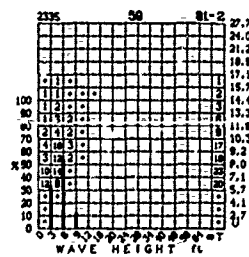
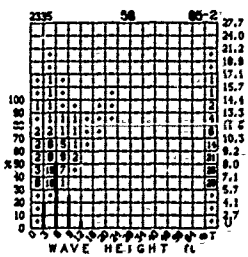
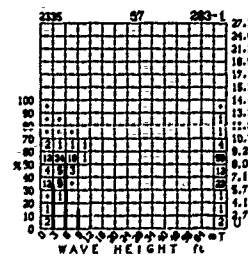
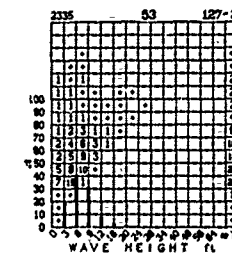
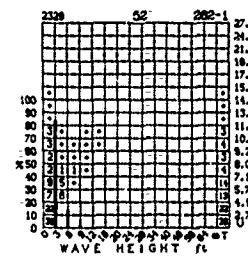
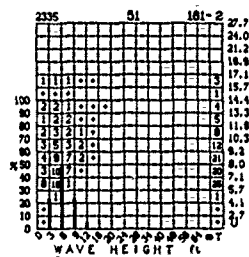
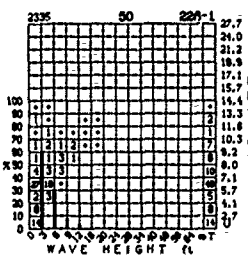
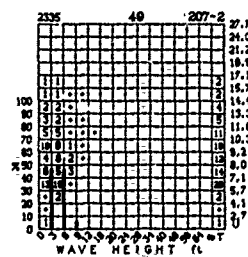
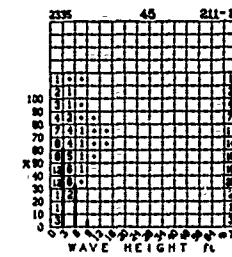
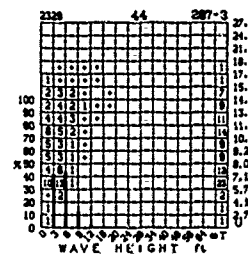
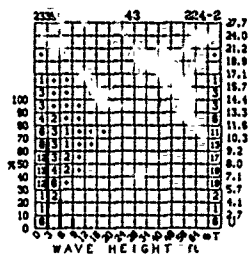
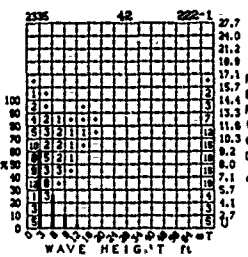
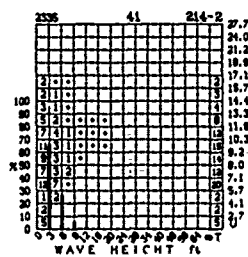
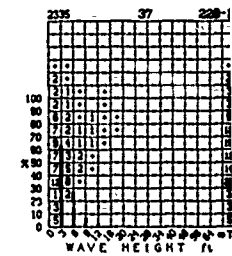
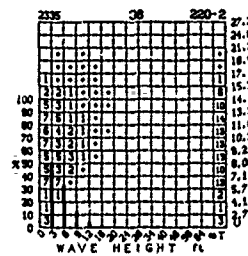
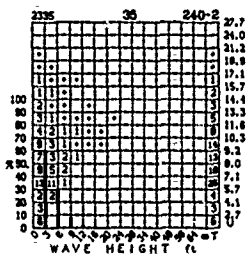
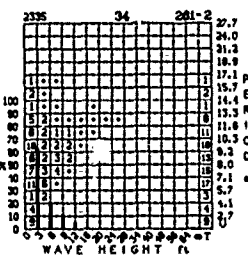
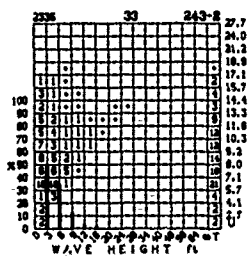


①

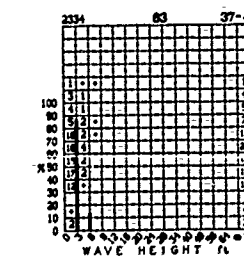
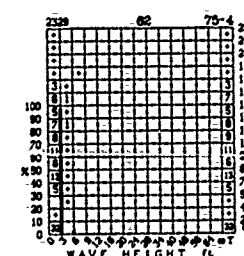
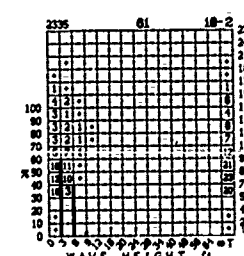
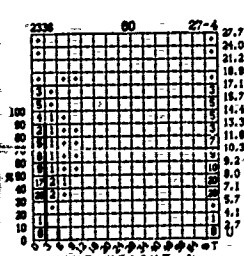
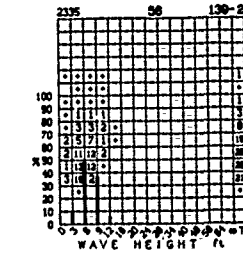
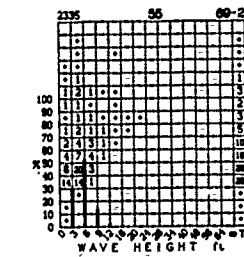
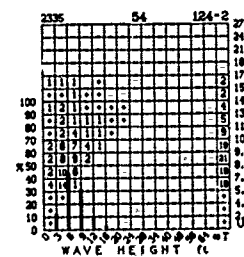
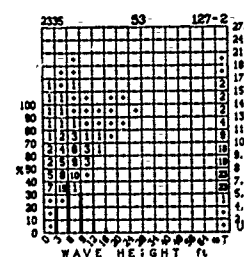
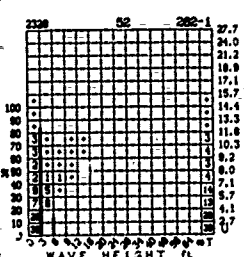
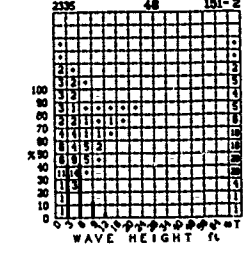
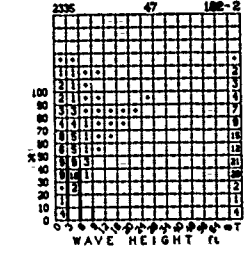
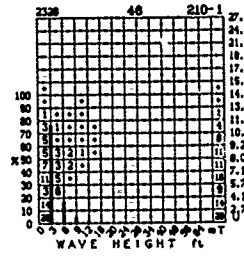
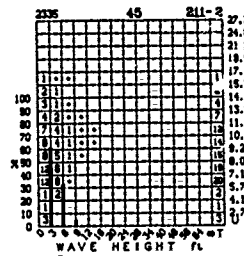
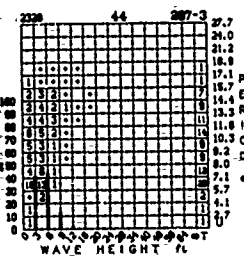
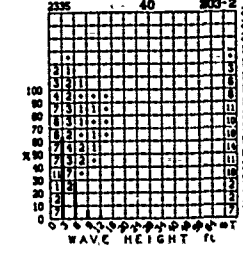
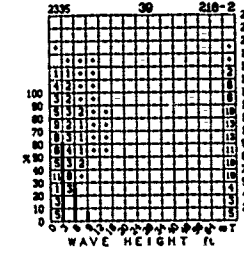
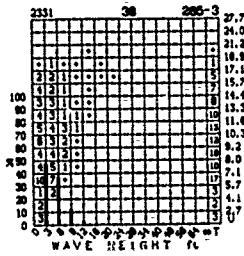
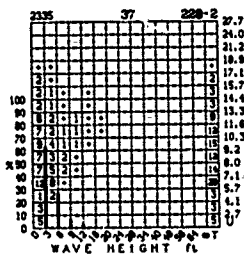
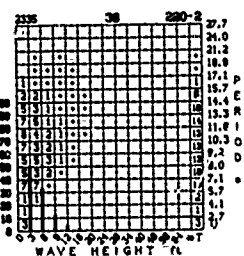
# WAVE HEIGHT AND PERIOD



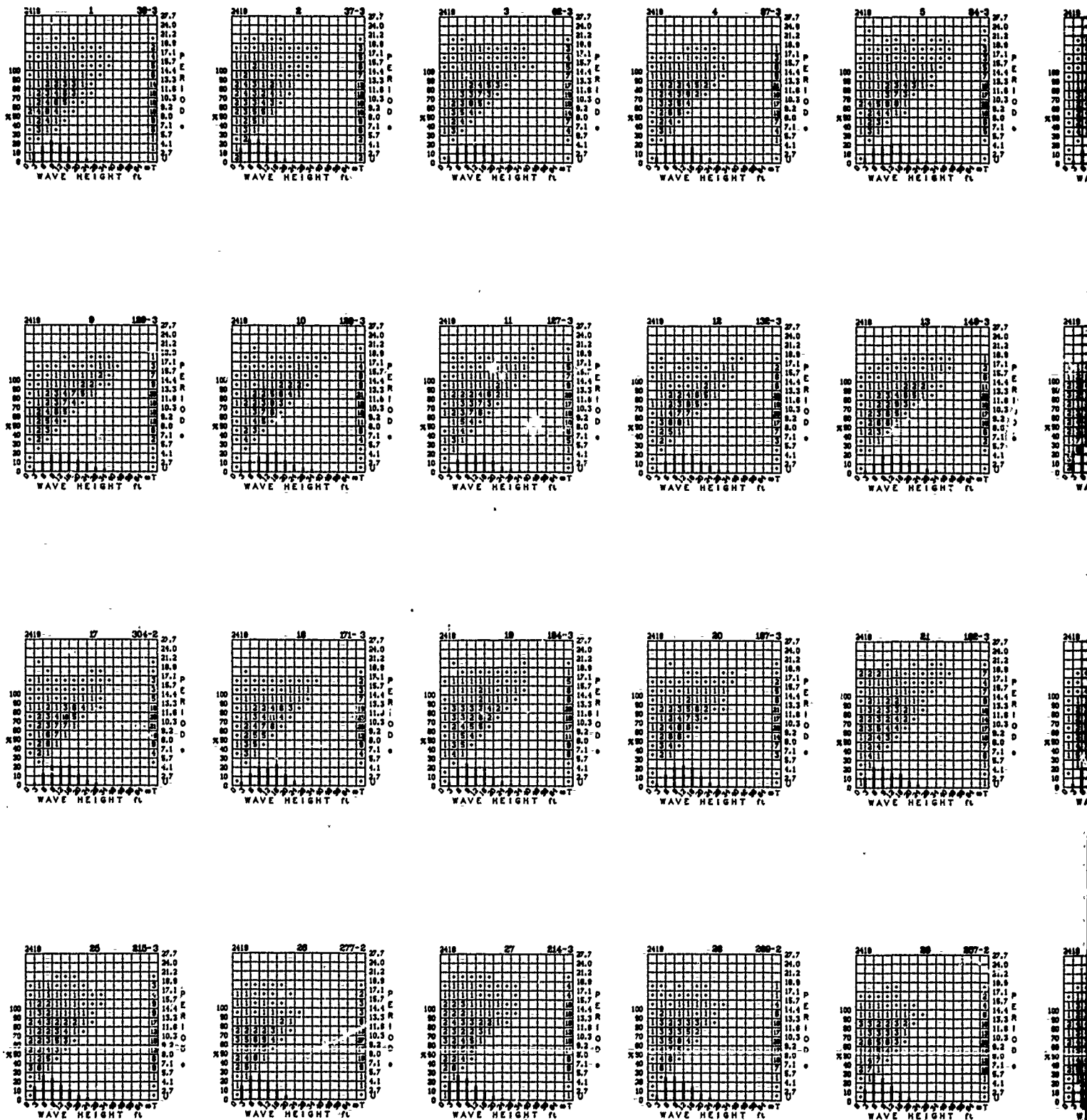
# WAVE HEIGHT AND PERIOD (Cont'd)



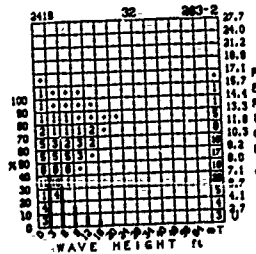
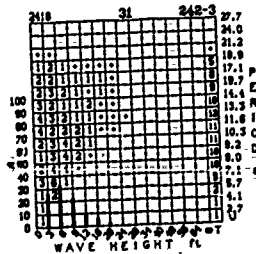
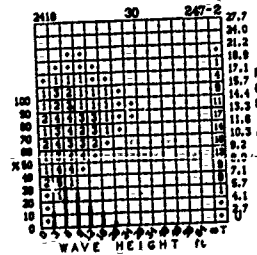
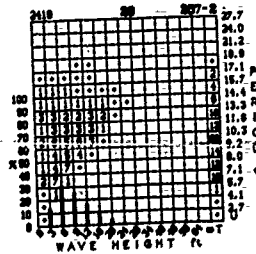
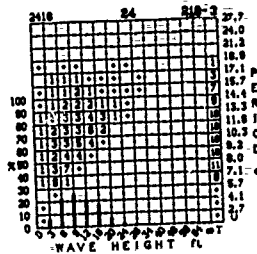
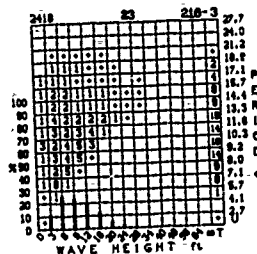
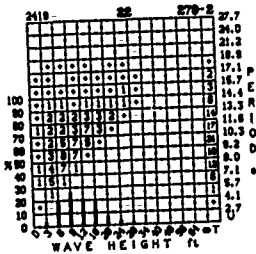
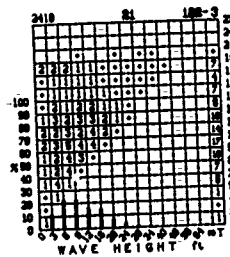
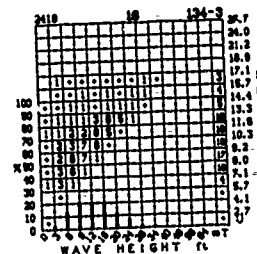
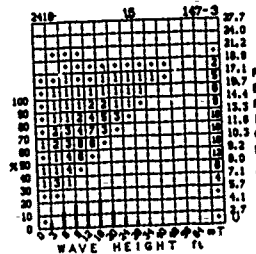
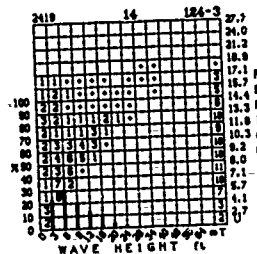
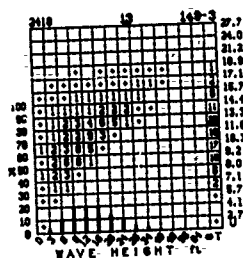
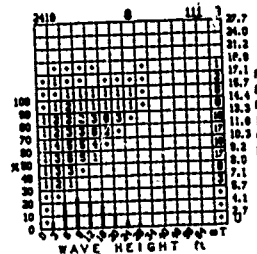
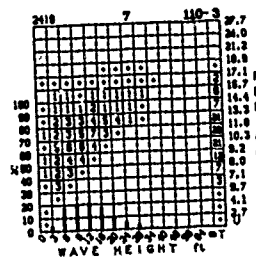
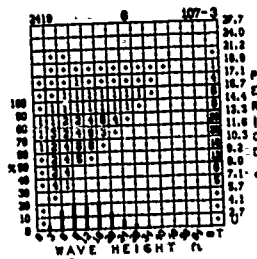
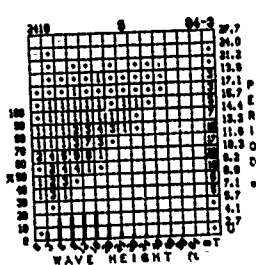
# SEPTEMBER



# OCTOBER

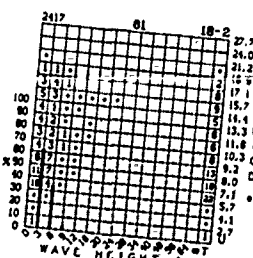
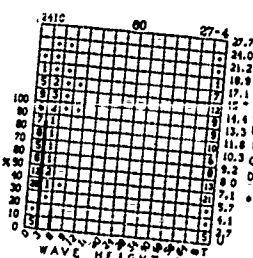
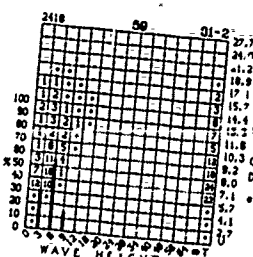
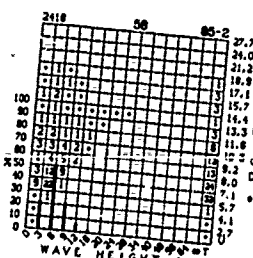
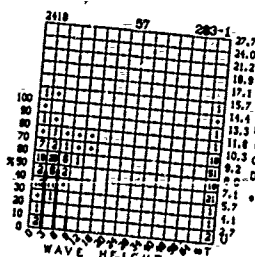
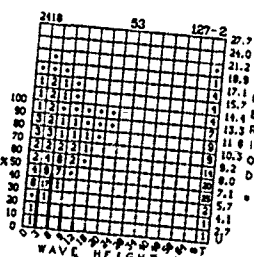
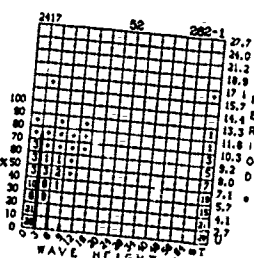
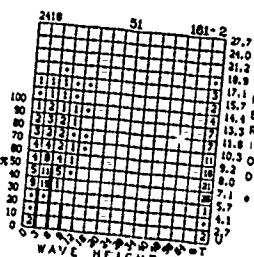
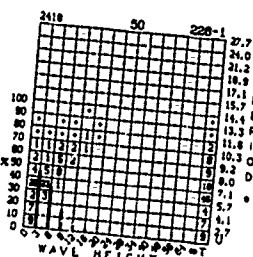
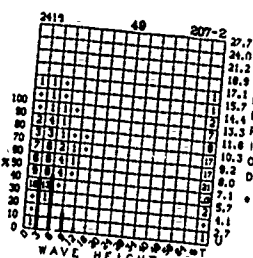
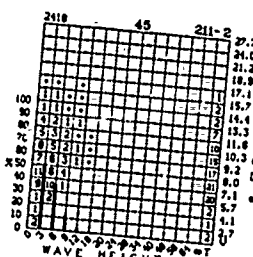
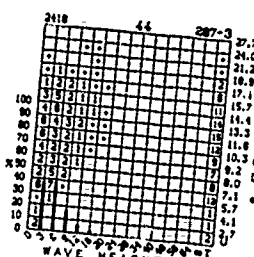
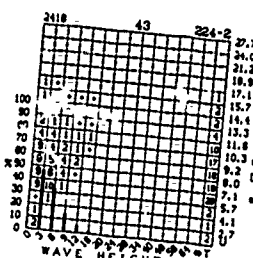
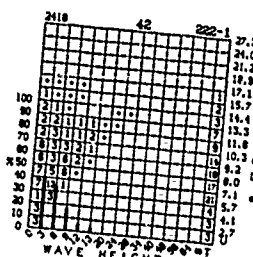
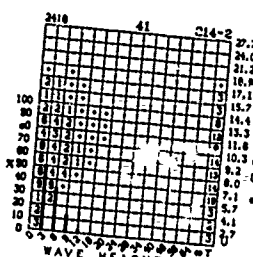
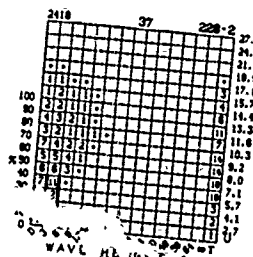
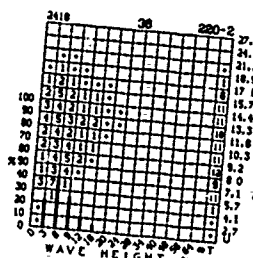
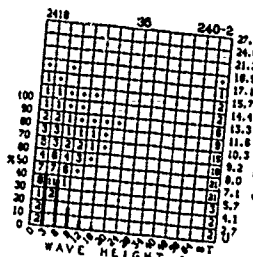
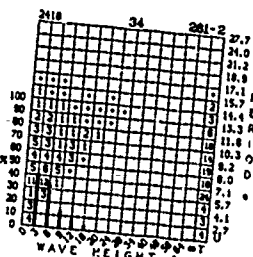
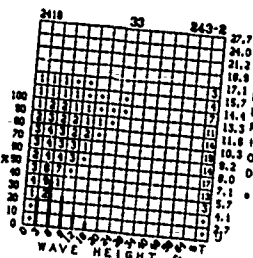


## WAVE HEIGHT AND PERIOD

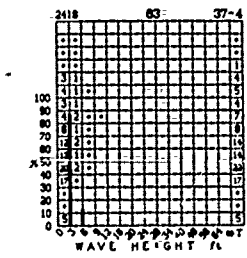
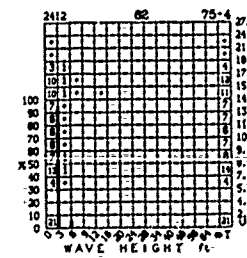
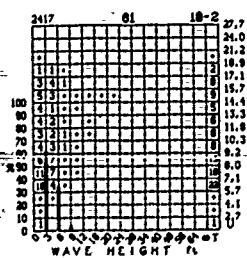
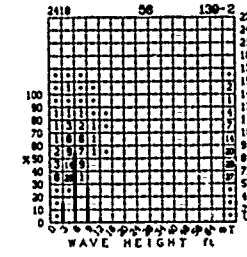
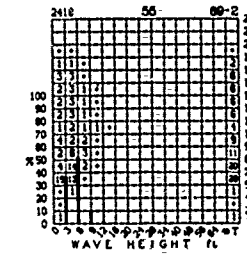
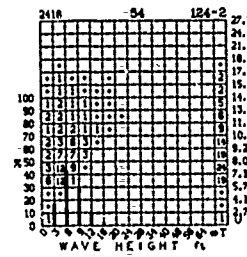
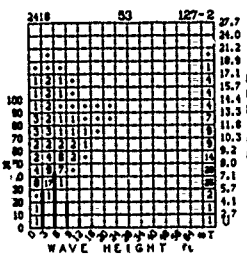
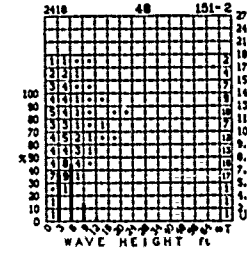
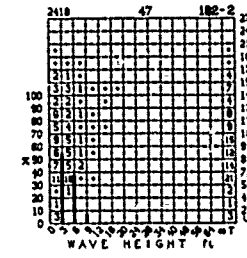
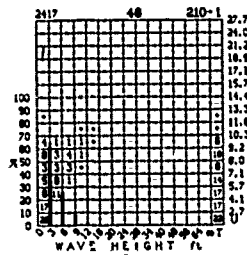
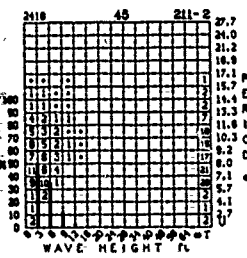
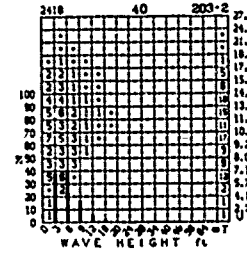
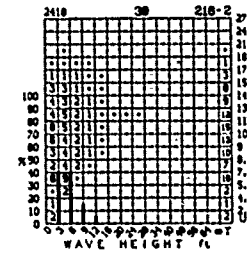
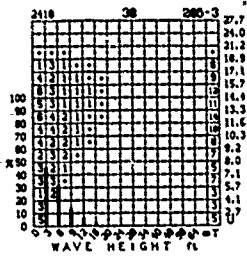
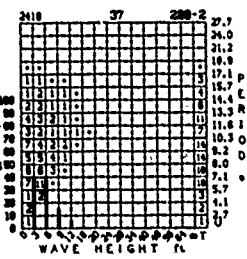




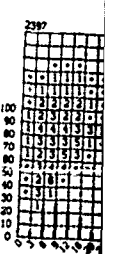
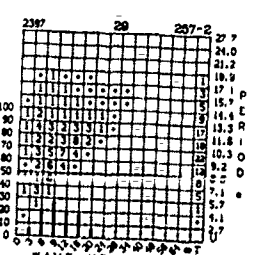
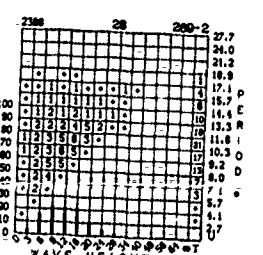
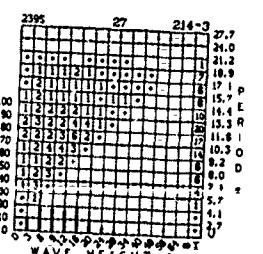
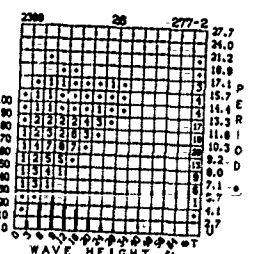
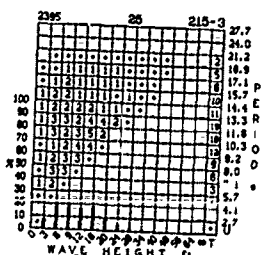
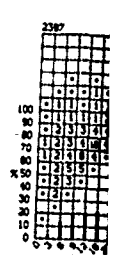
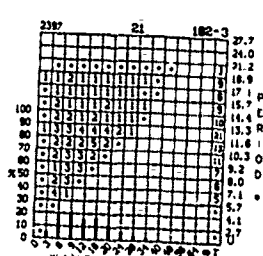
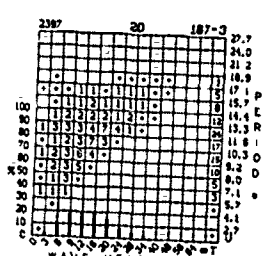
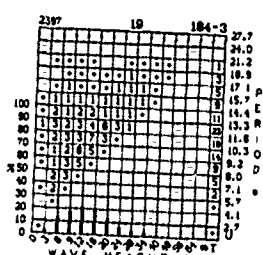
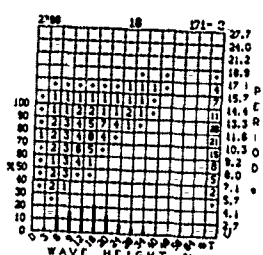
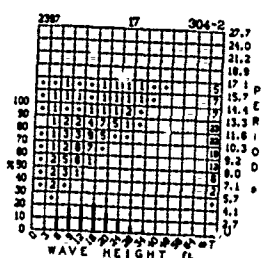
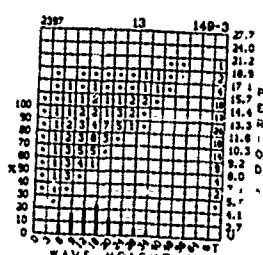
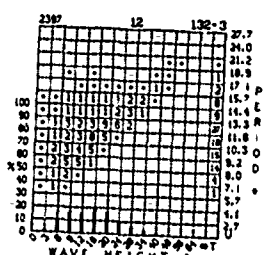
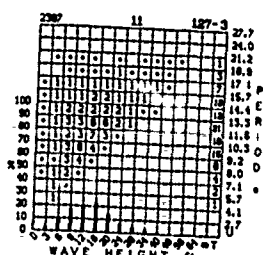
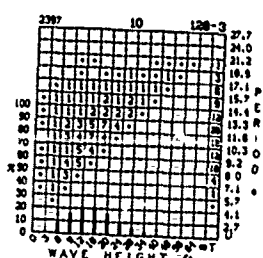
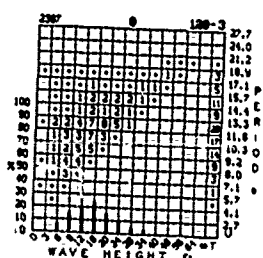
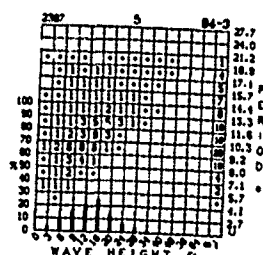
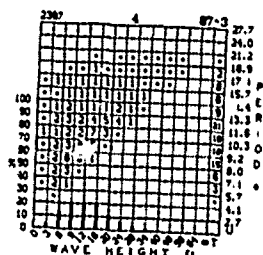
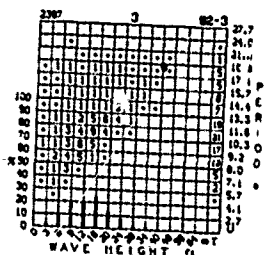
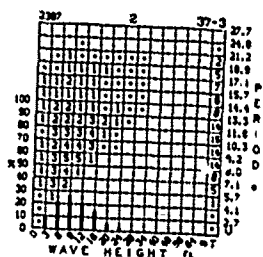
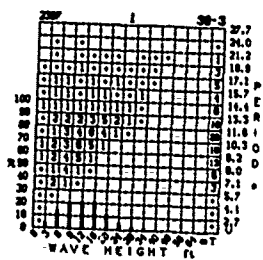
# WAVE HEIGHT AND PERIOD (Cont'd)



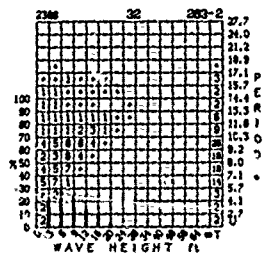
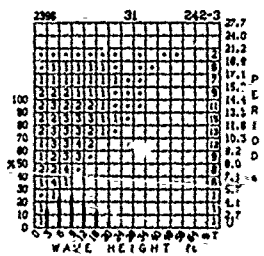
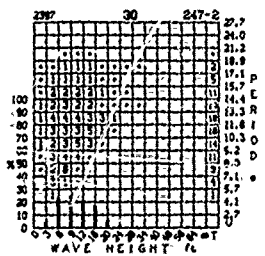
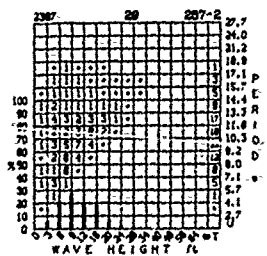
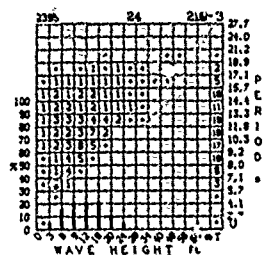
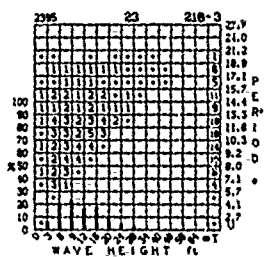
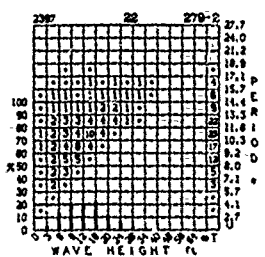
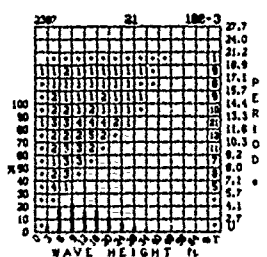
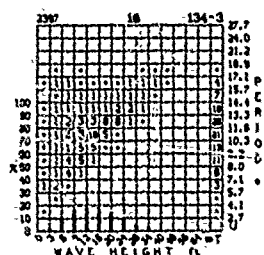
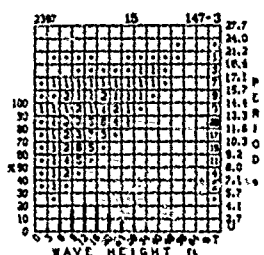
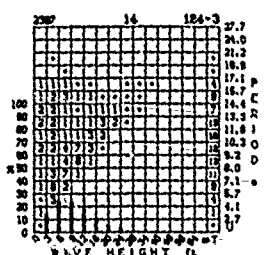
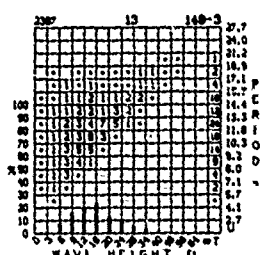
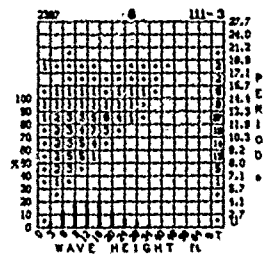
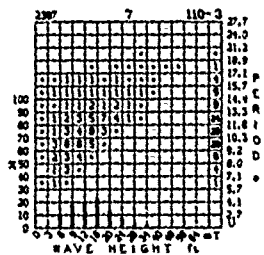
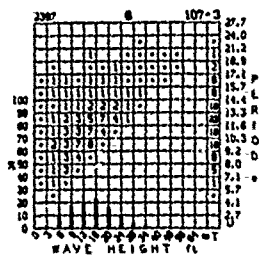
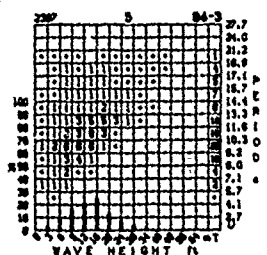
# OCTOBER



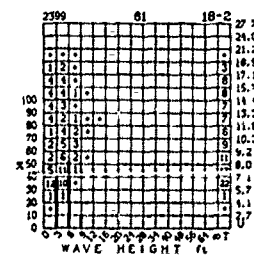
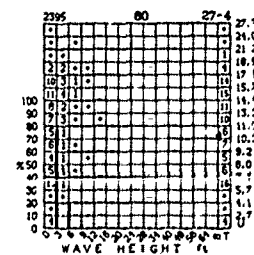
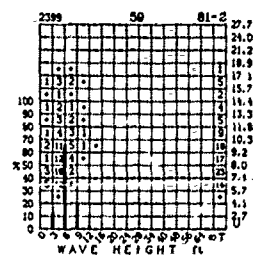
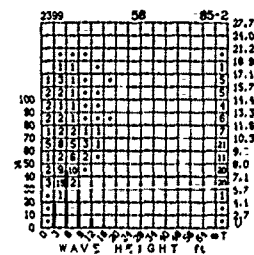
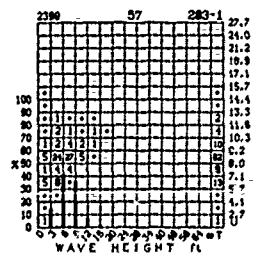
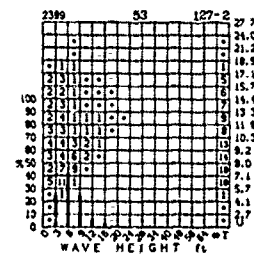
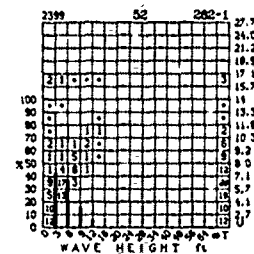
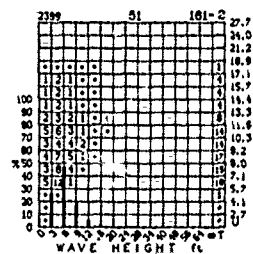
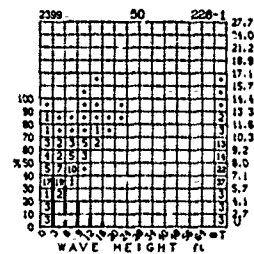
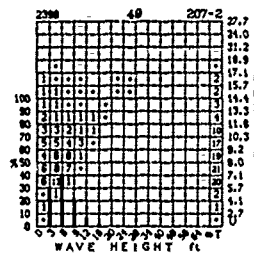
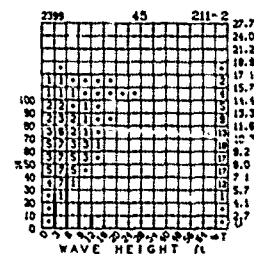
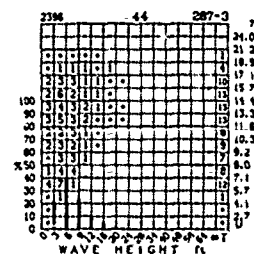
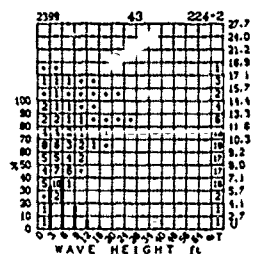
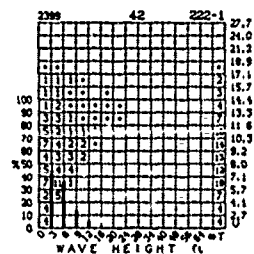
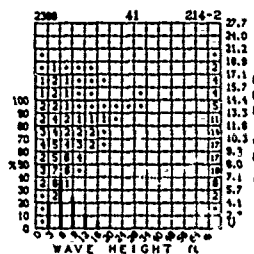
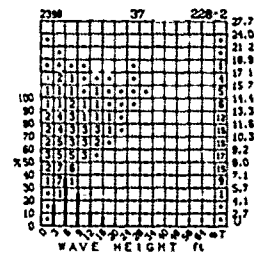
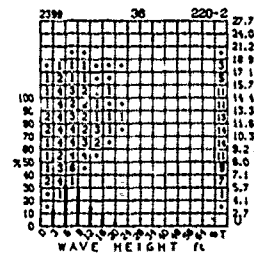
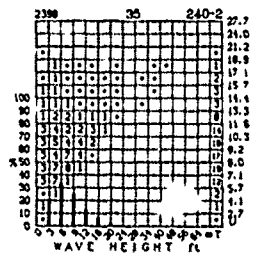
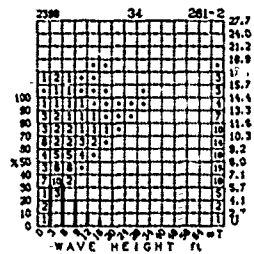
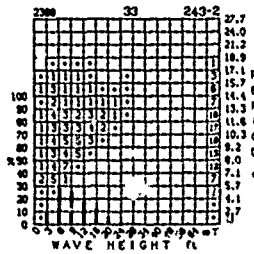
# NOVEMBER



## U



# WAVE HEIGHT AND PERIOD (Cont'd)

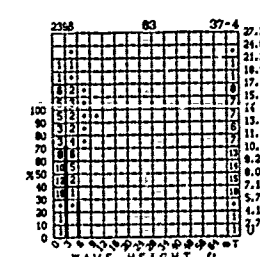
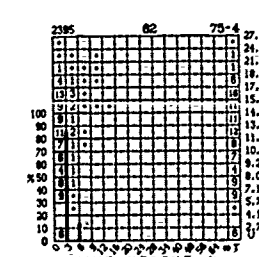
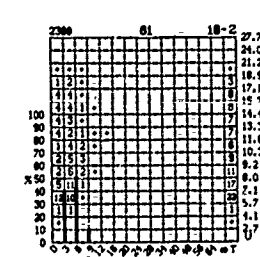
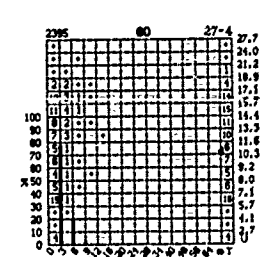
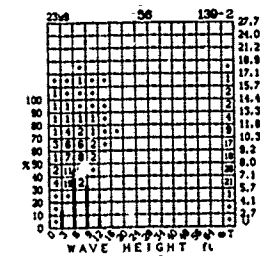
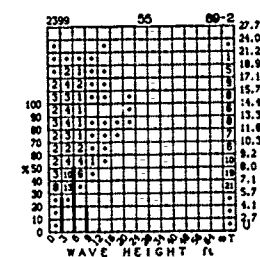
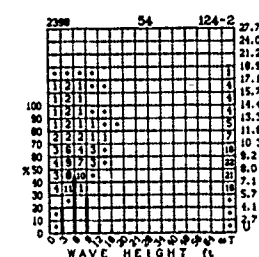
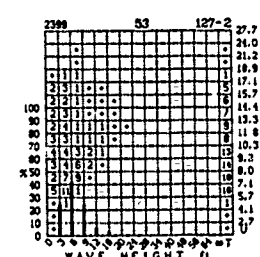
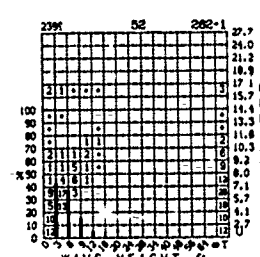
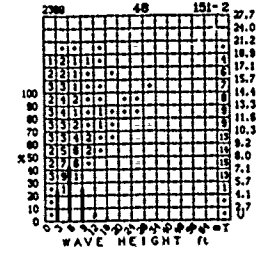
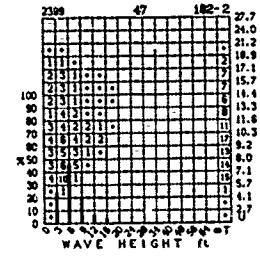
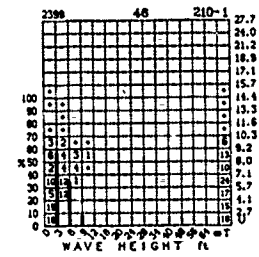
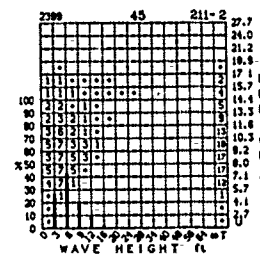
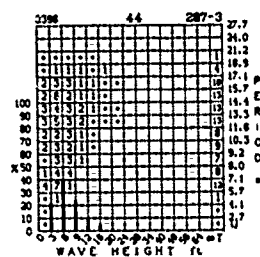
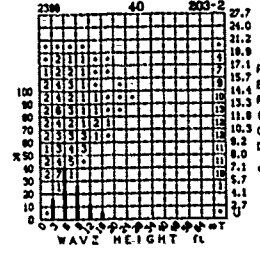
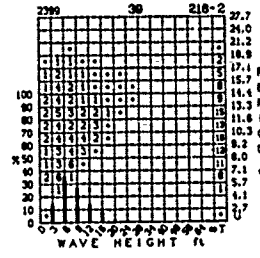
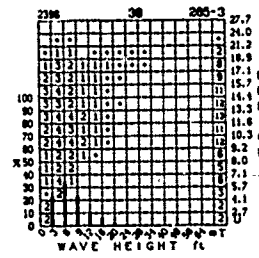
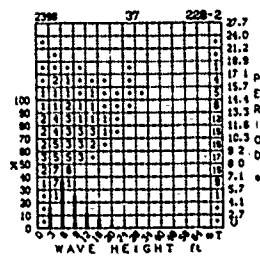
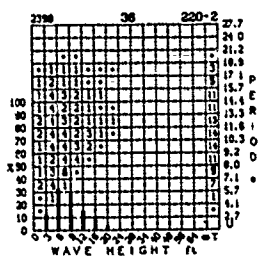


①

ont'd)

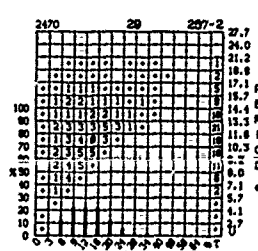
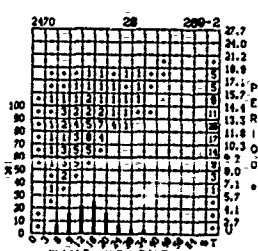
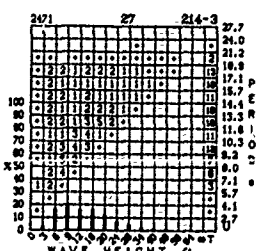
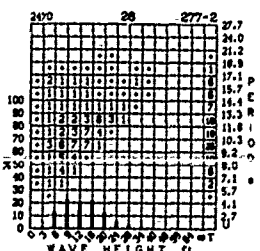
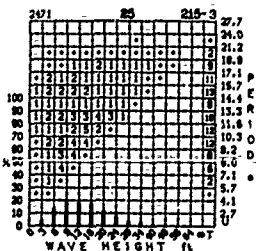
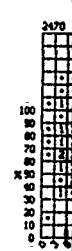
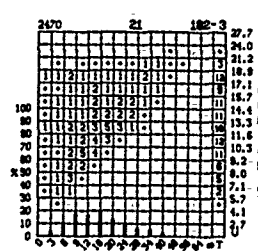
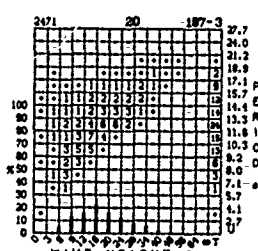
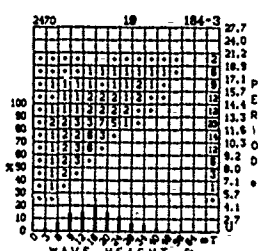
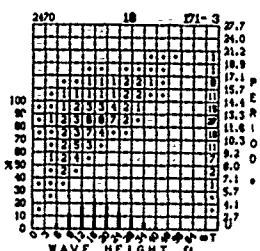
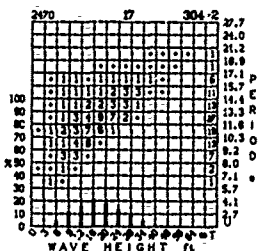
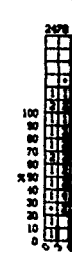
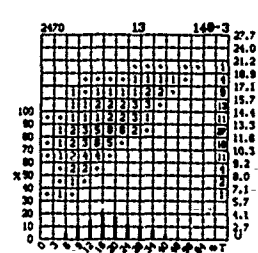
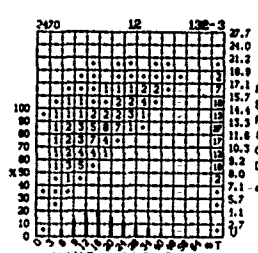
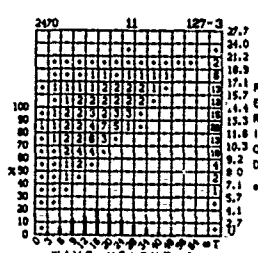
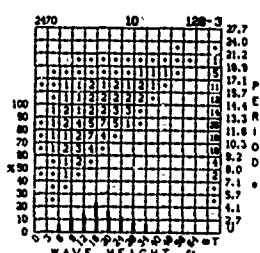
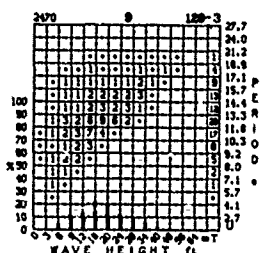
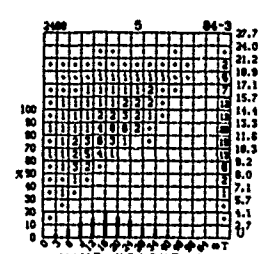
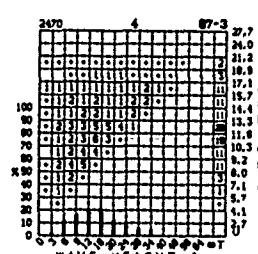
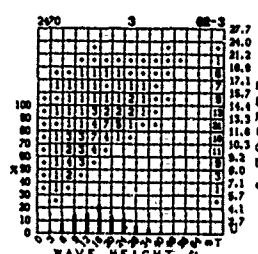
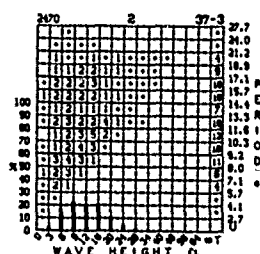
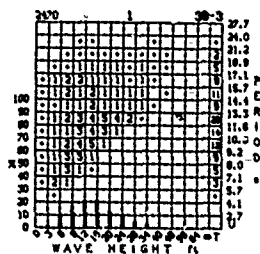
NOVEMBER

27.7  
24.0  
21.2  
18.9  
16.4  
14.4  
13.3  
11.6  
10.3  
9.2  
8.0  
7.1  
6.1  
5.7  
4.1  
2.7



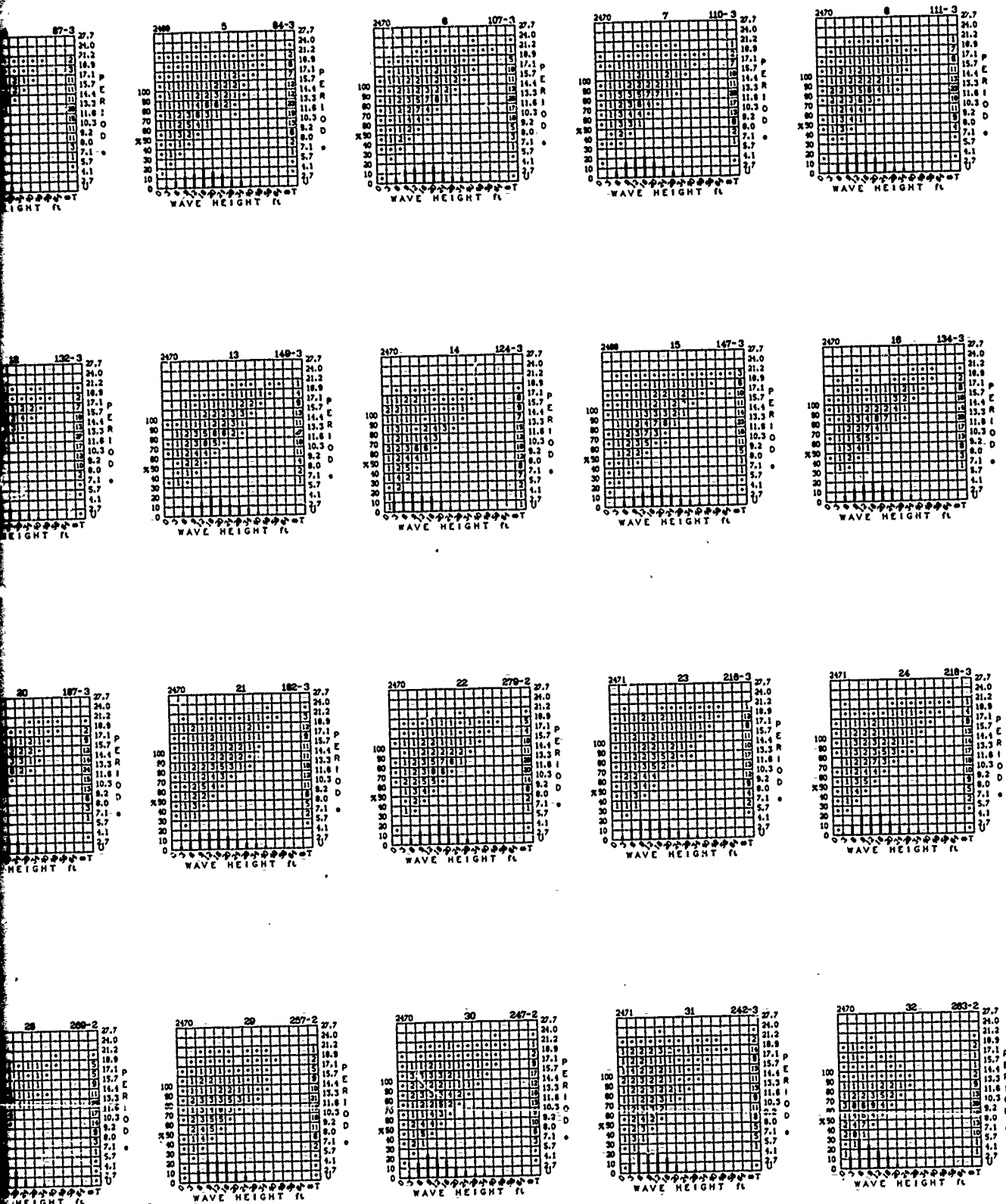


# DECEMBER

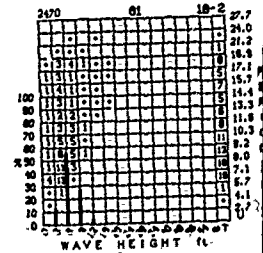
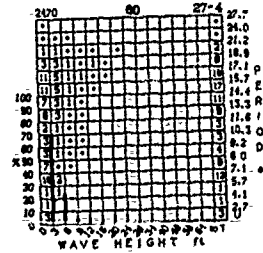
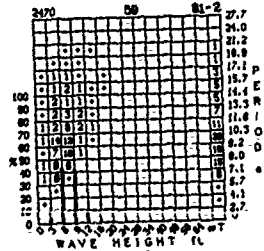
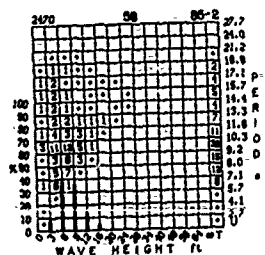
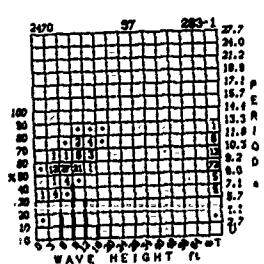
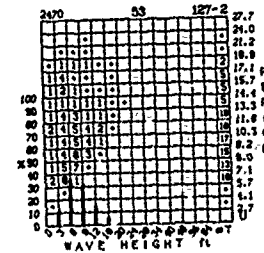
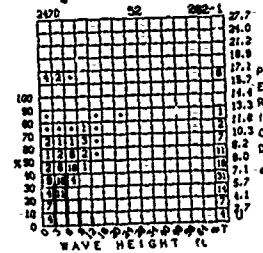
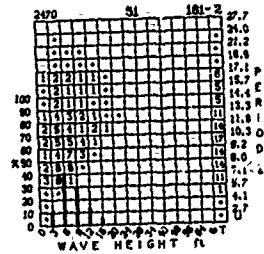
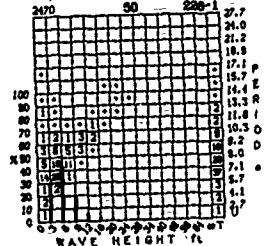
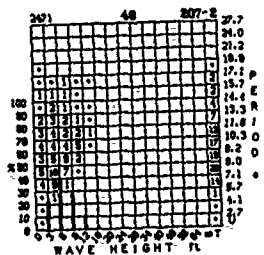
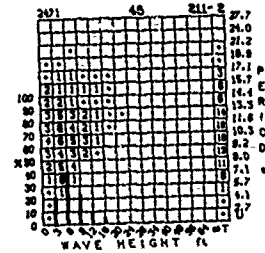
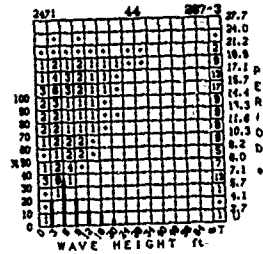
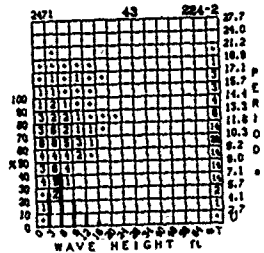
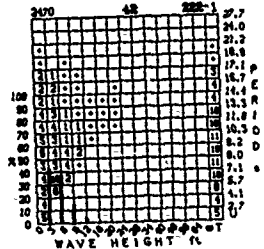
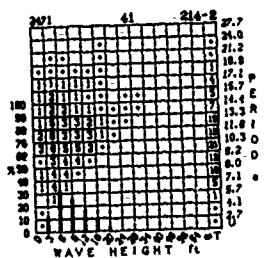
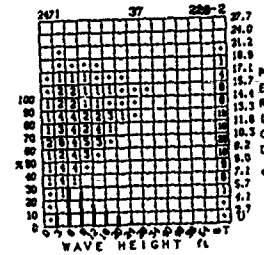
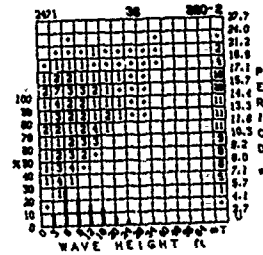
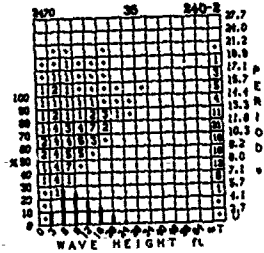
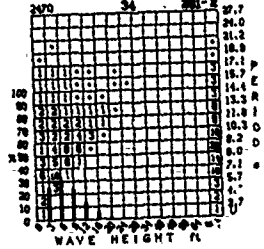
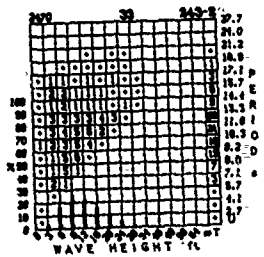




# WAVE HEIGHT AND PERIOD

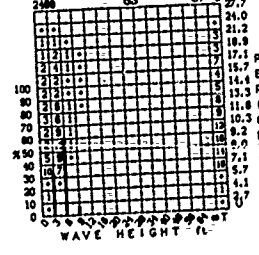
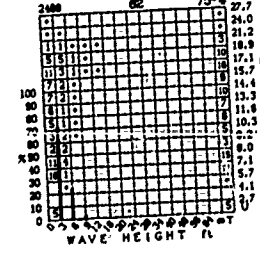
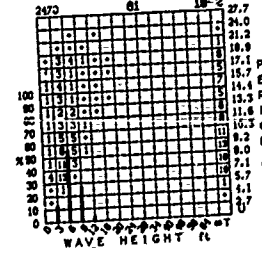
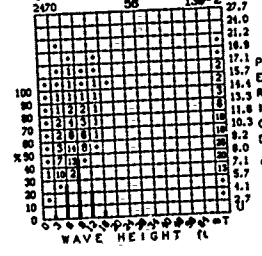
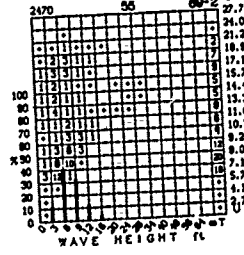
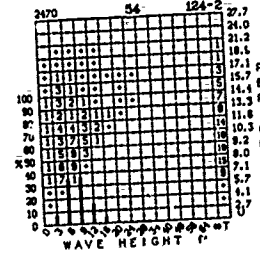
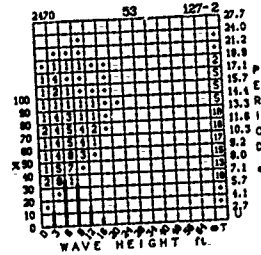
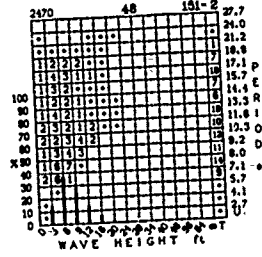
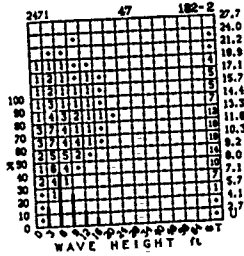
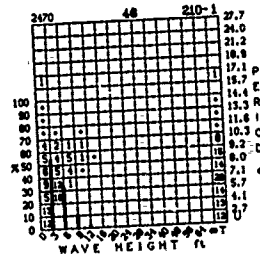
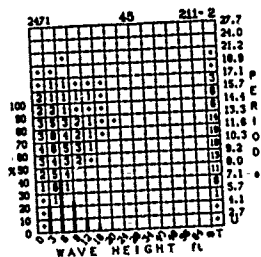
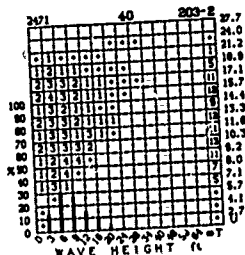
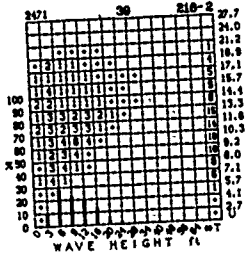
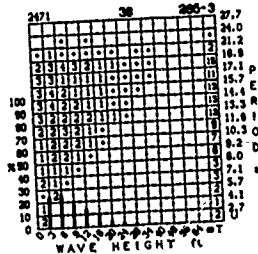
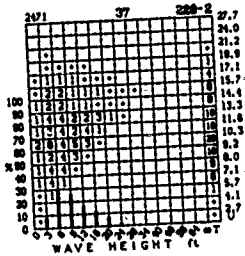


# WAVE HEIGHT AND PERIOD (Cont'd)

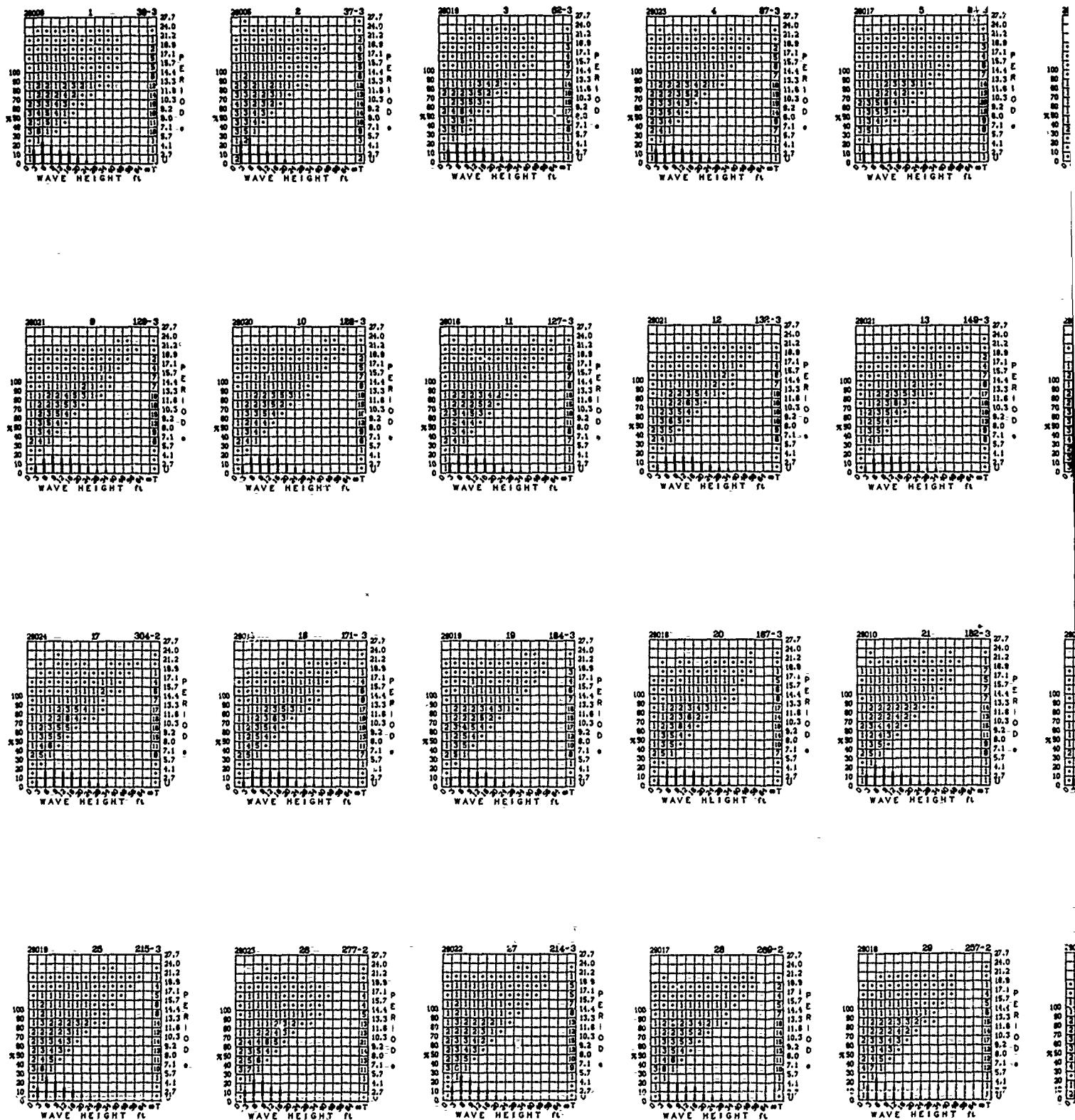


1

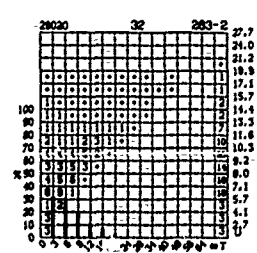
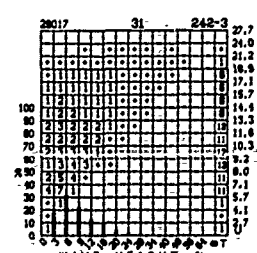
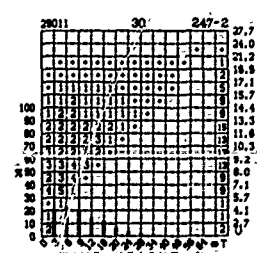
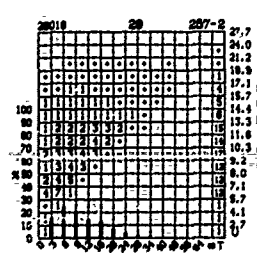
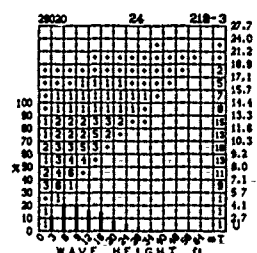
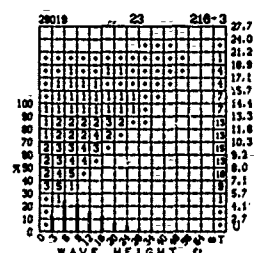
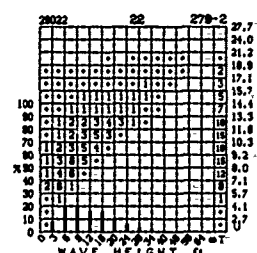
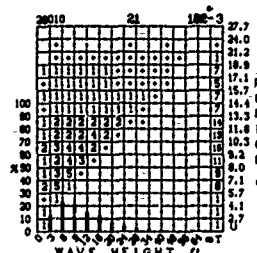
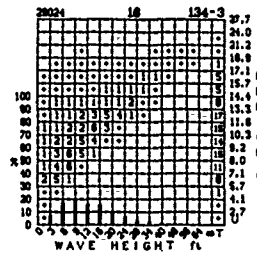
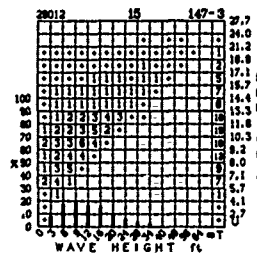
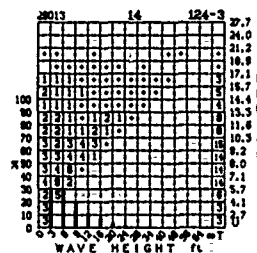
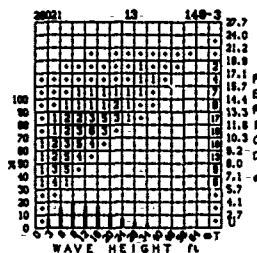
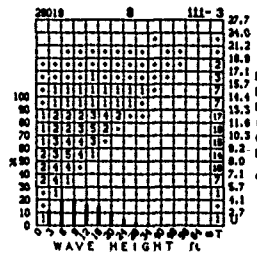
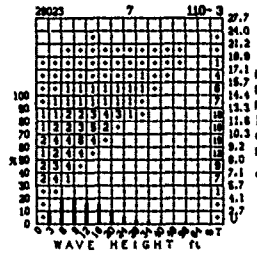
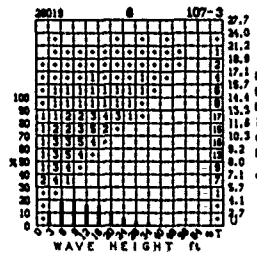
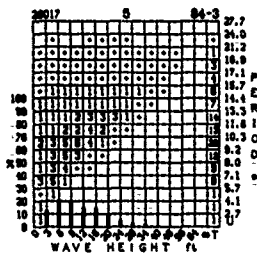
# DECEMBER



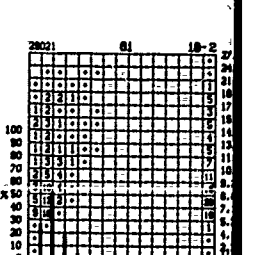
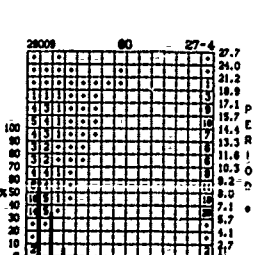
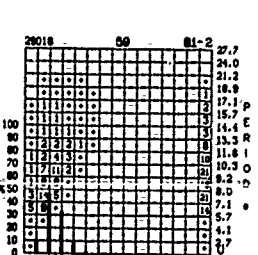
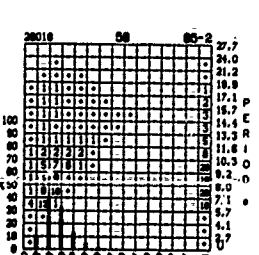
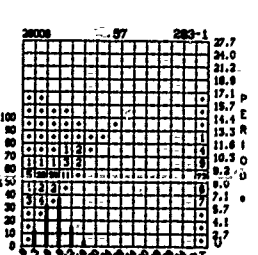
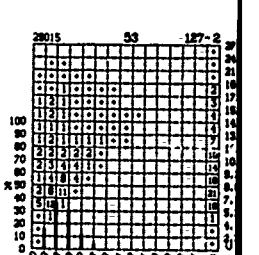
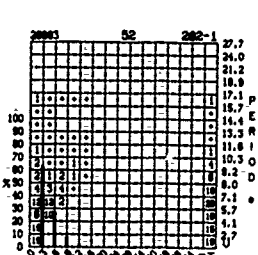
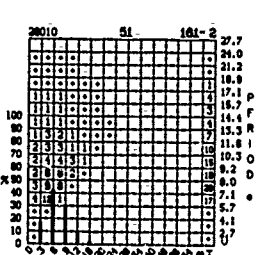
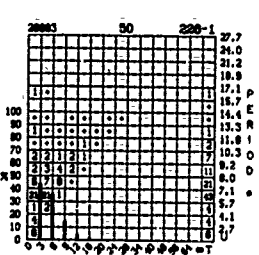
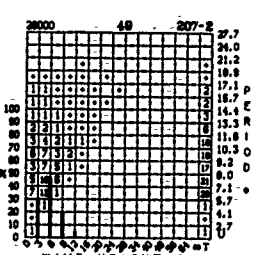
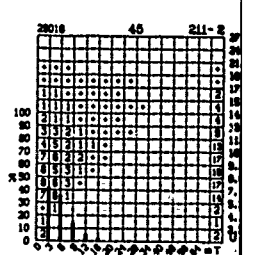
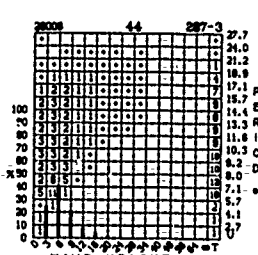
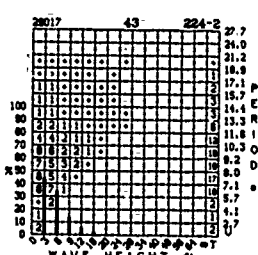
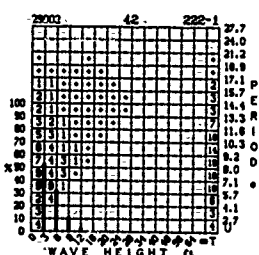
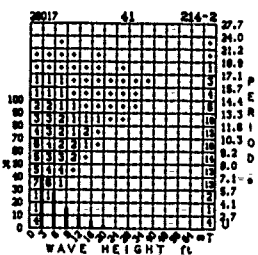
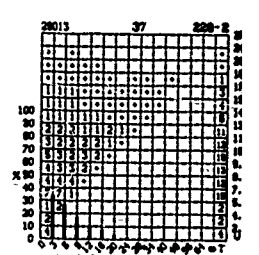
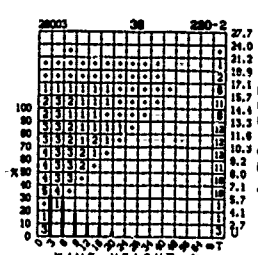
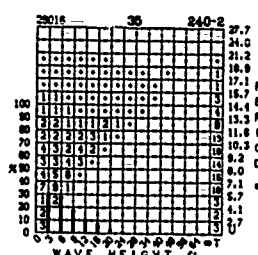
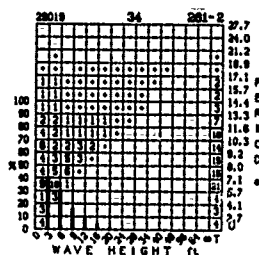
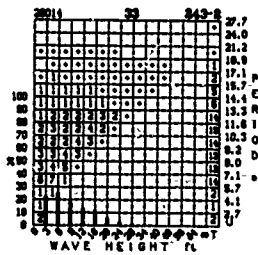
# ANNUAL



# WAVE HEIGHT AND PERIOD

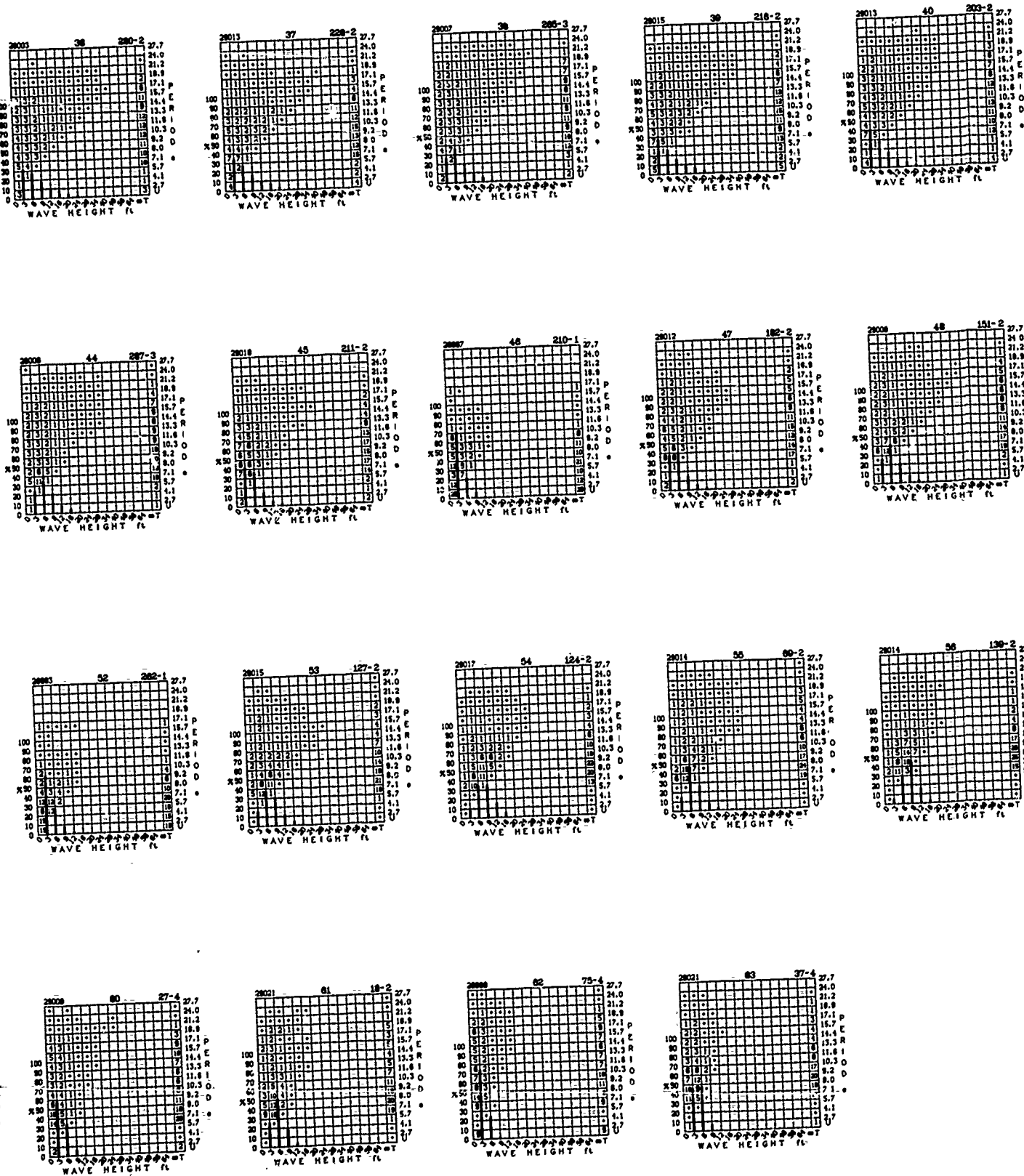


# WAVE HEIGHT AND PERIOD (Cont'd)





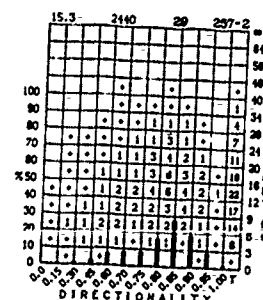
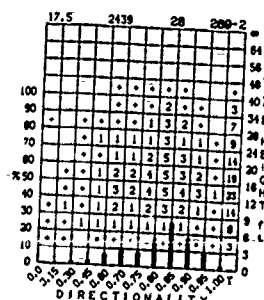
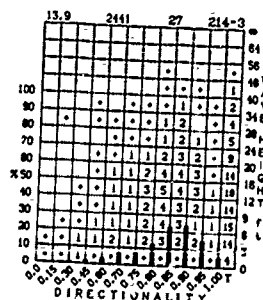
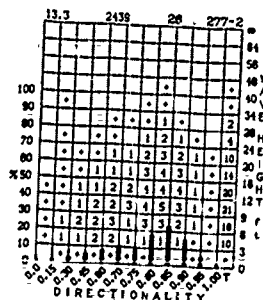
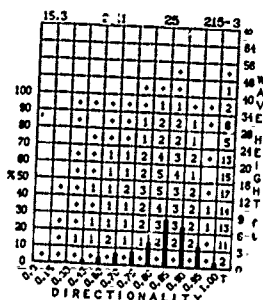
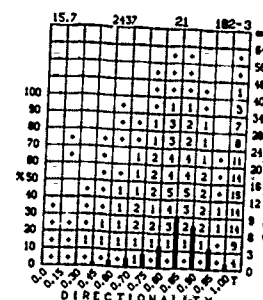
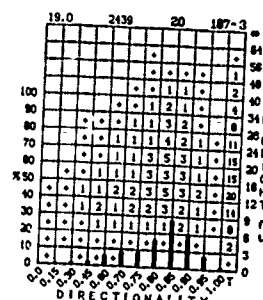
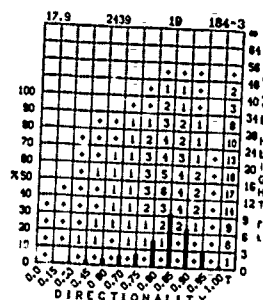
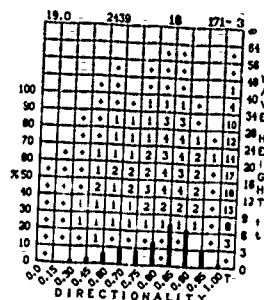
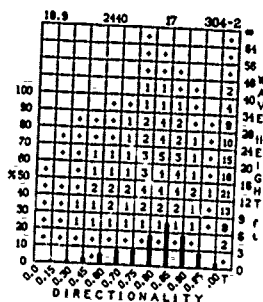
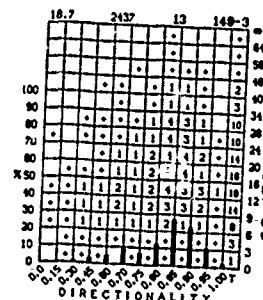
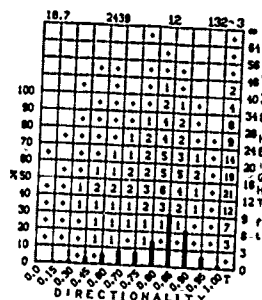
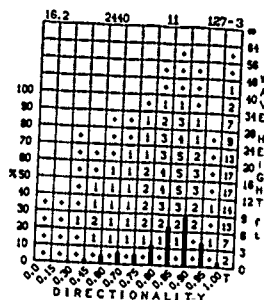
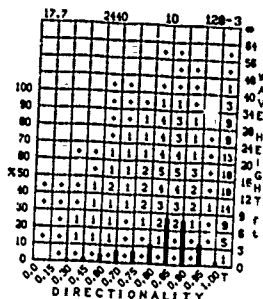
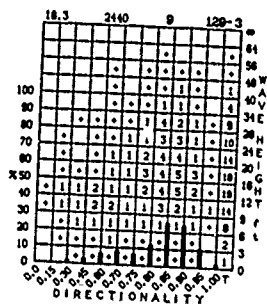
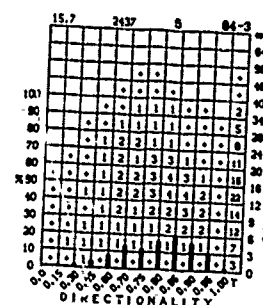
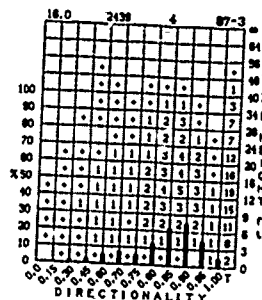
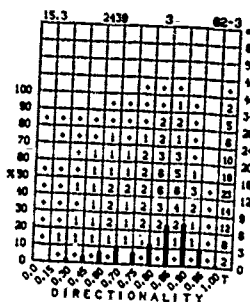
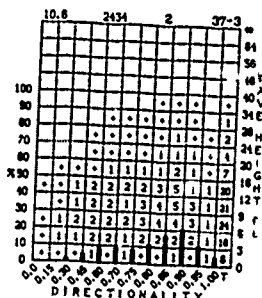
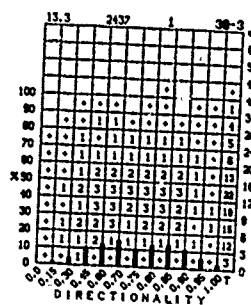
# ANNUAL



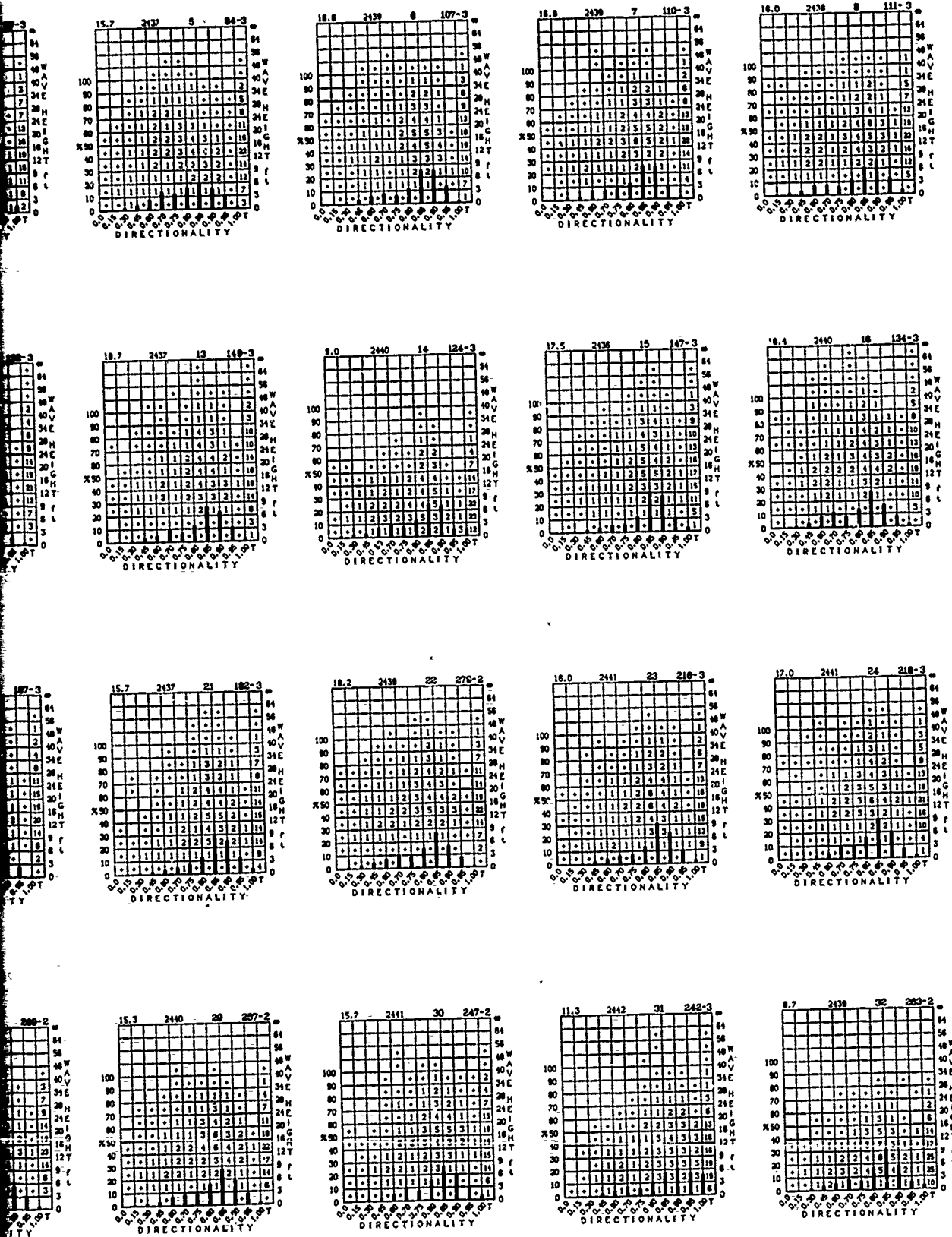


# JANUARY

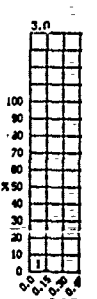
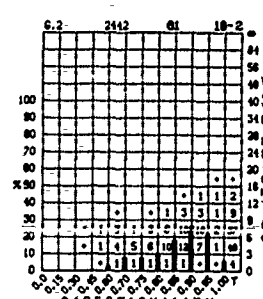
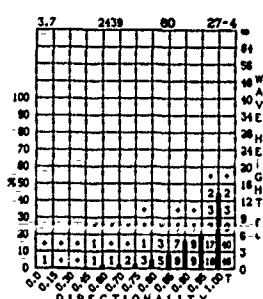
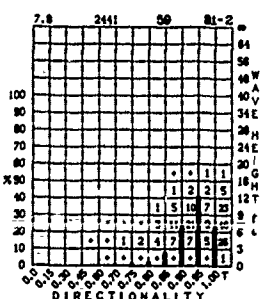
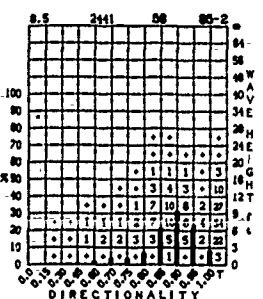
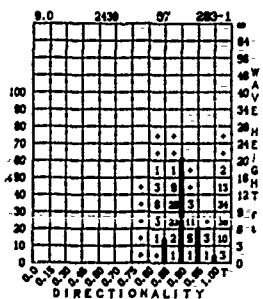
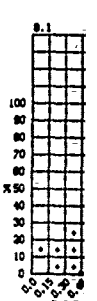
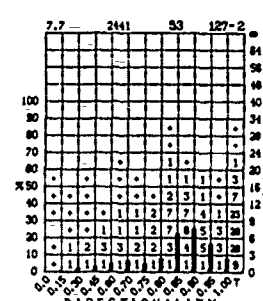
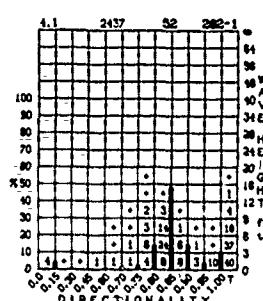
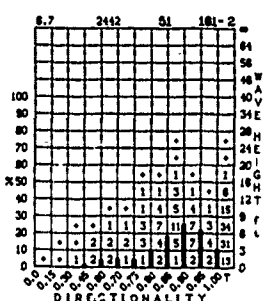
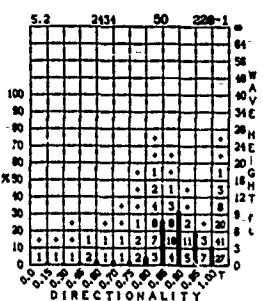
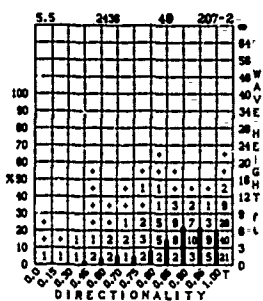
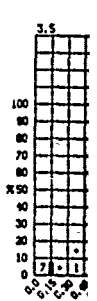
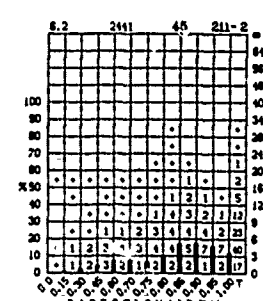
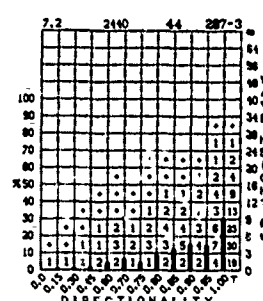
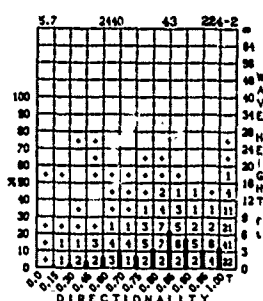
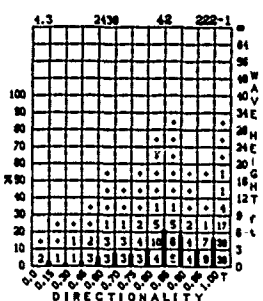
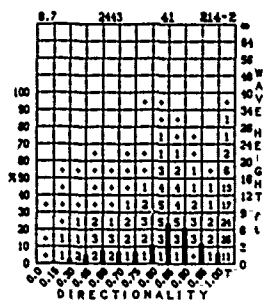
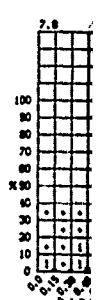
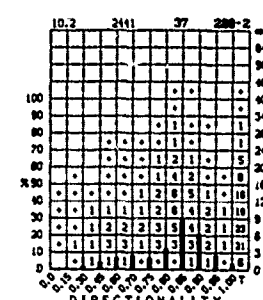
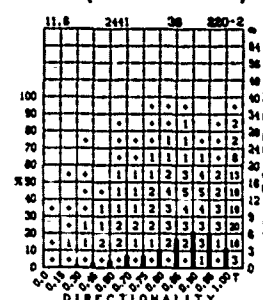
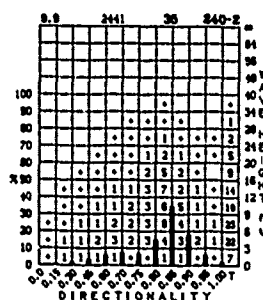
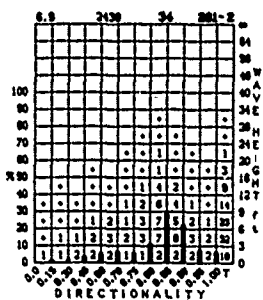
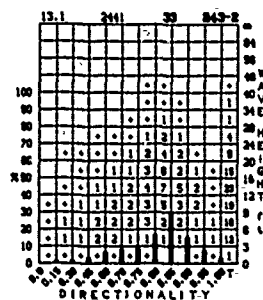
WA



# WAVE HEIGHT AND DIRECTIONALITY



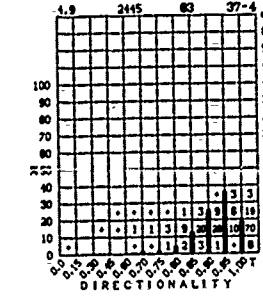
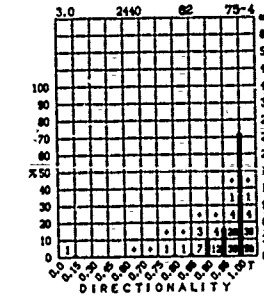
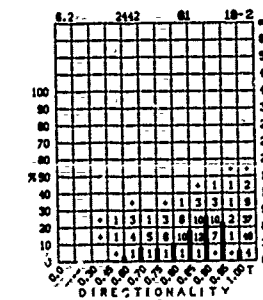
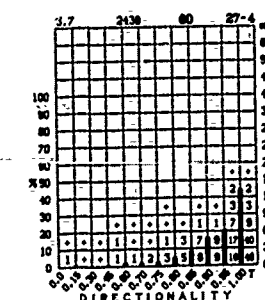
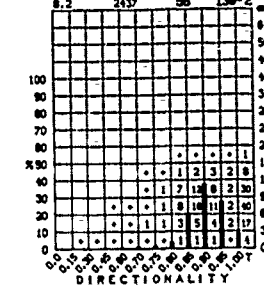
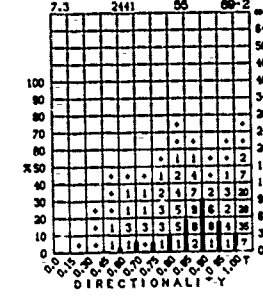
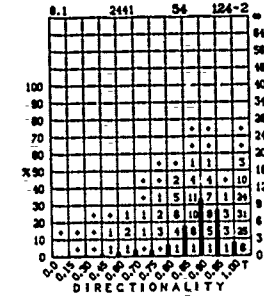
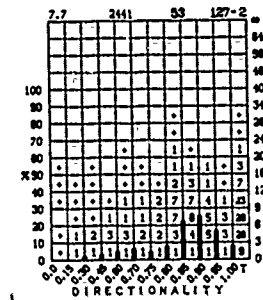
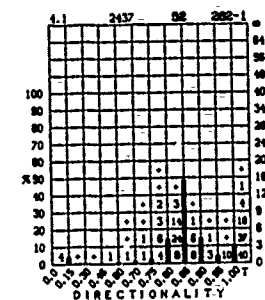
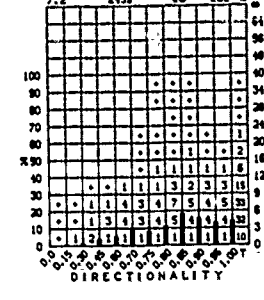
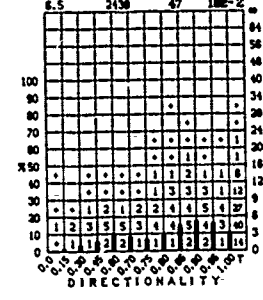
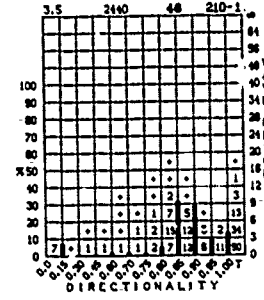
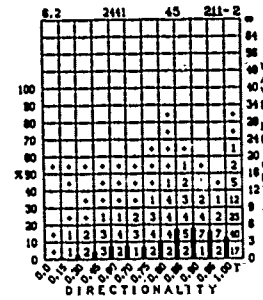
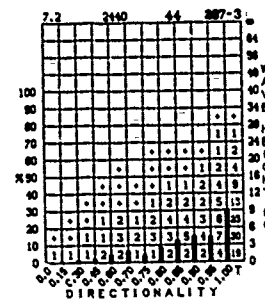
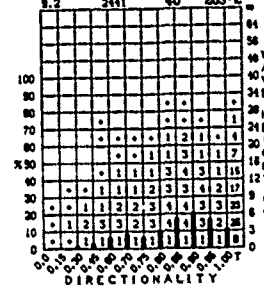
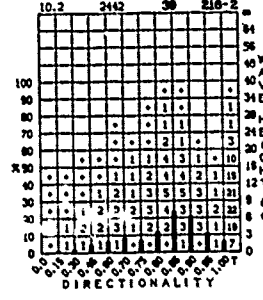
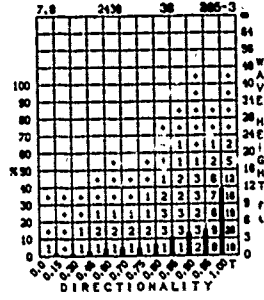
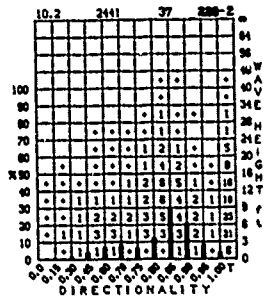
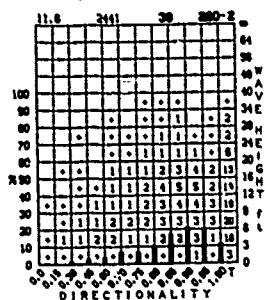
# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)



10

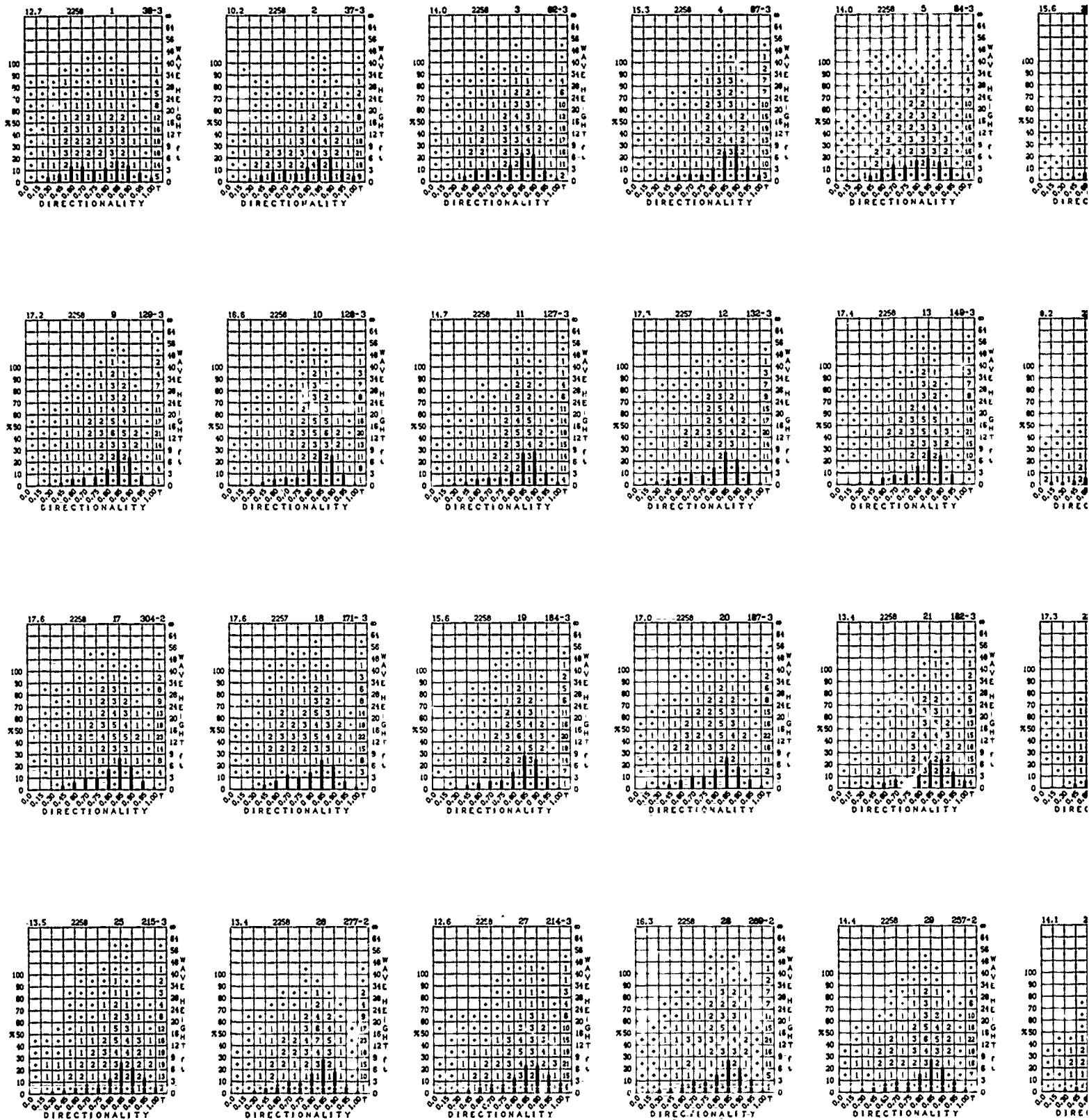
ITY (Cont'd)

JANUARY

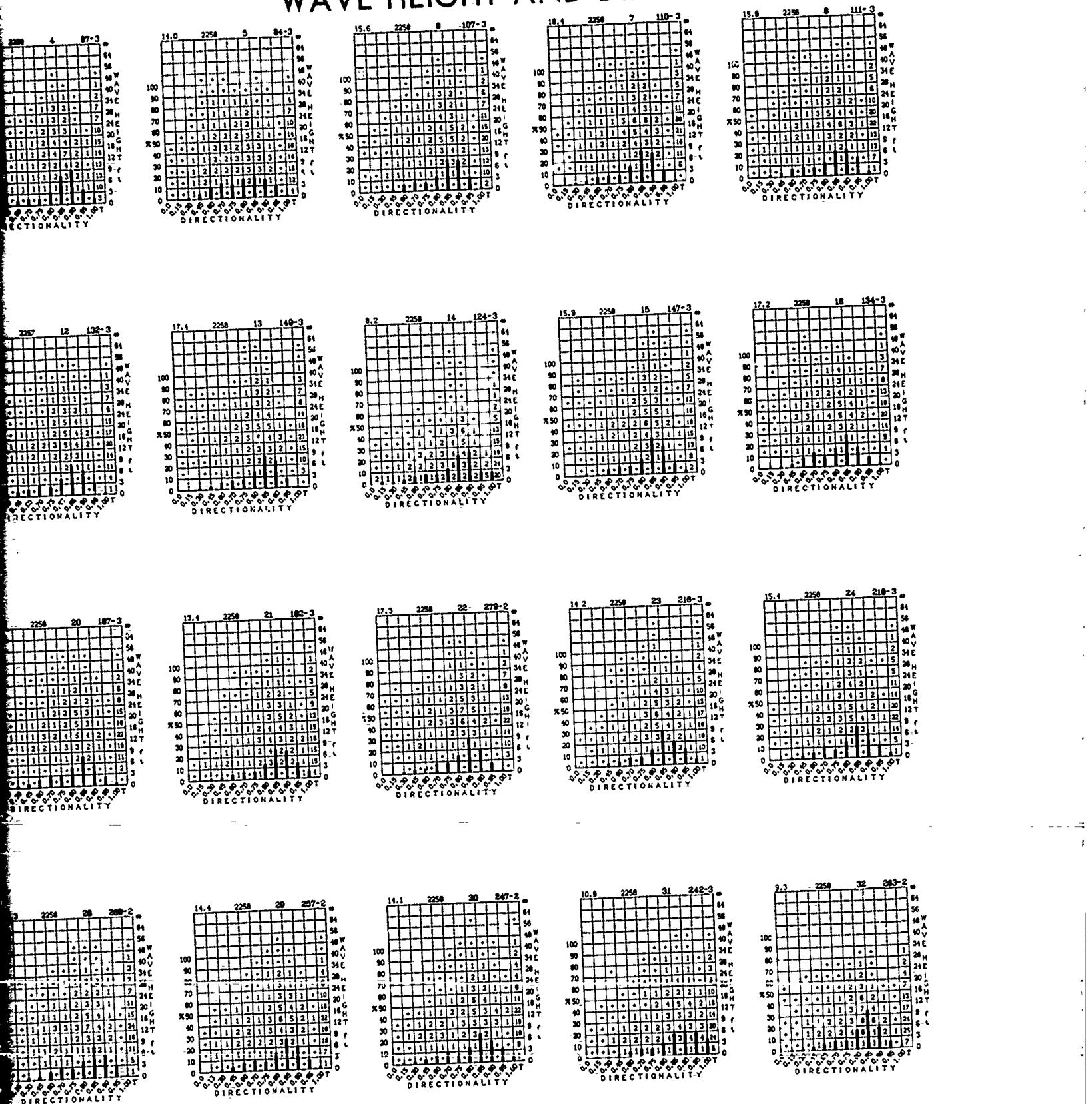


# FEBRUARY

# WAVE H

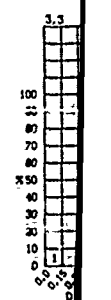
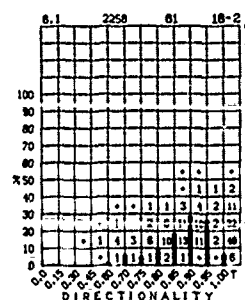
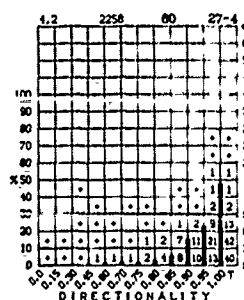
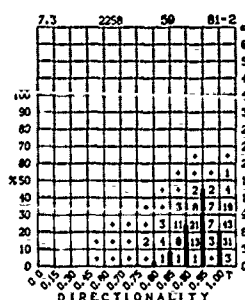
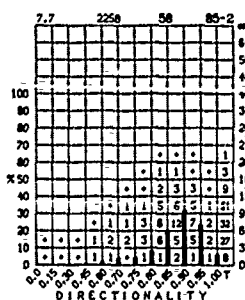
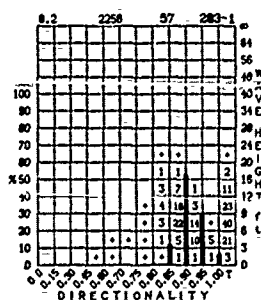
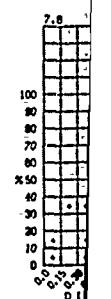
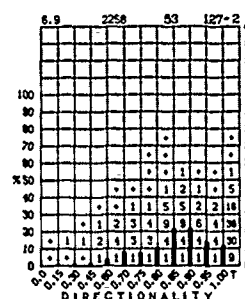
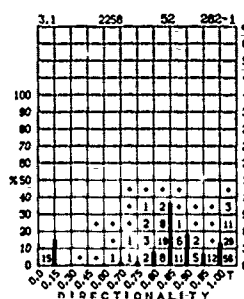
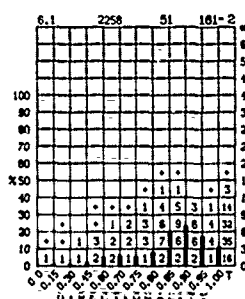
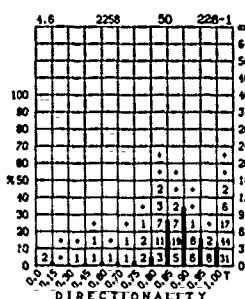
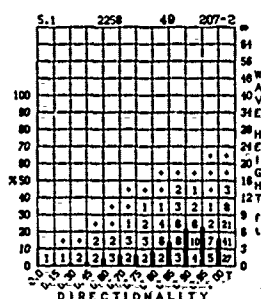
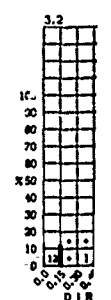
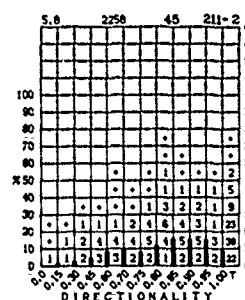
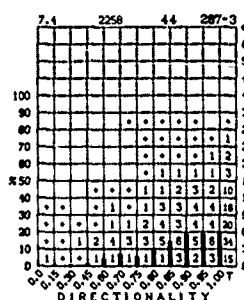
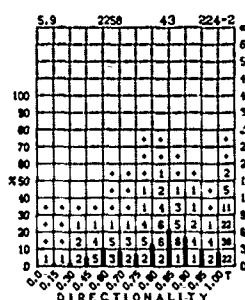
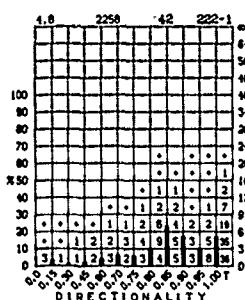
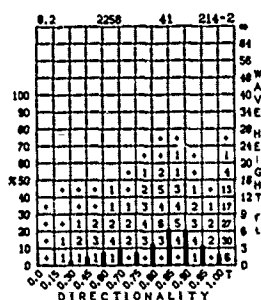
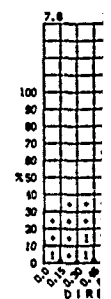
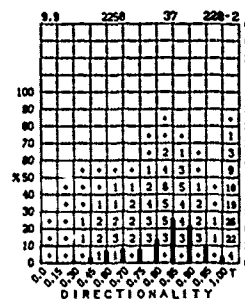
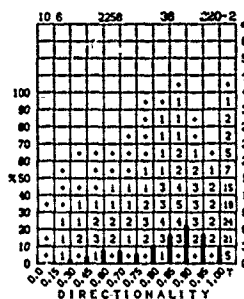
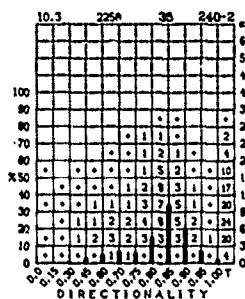
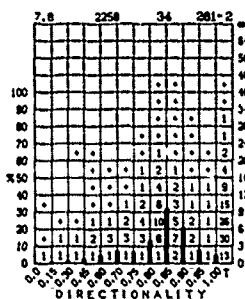
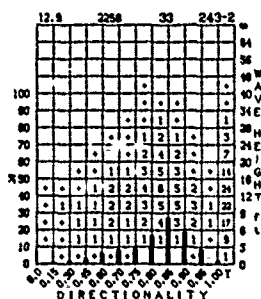


# WAVE HEIGHT AND DIRECTIONALITY



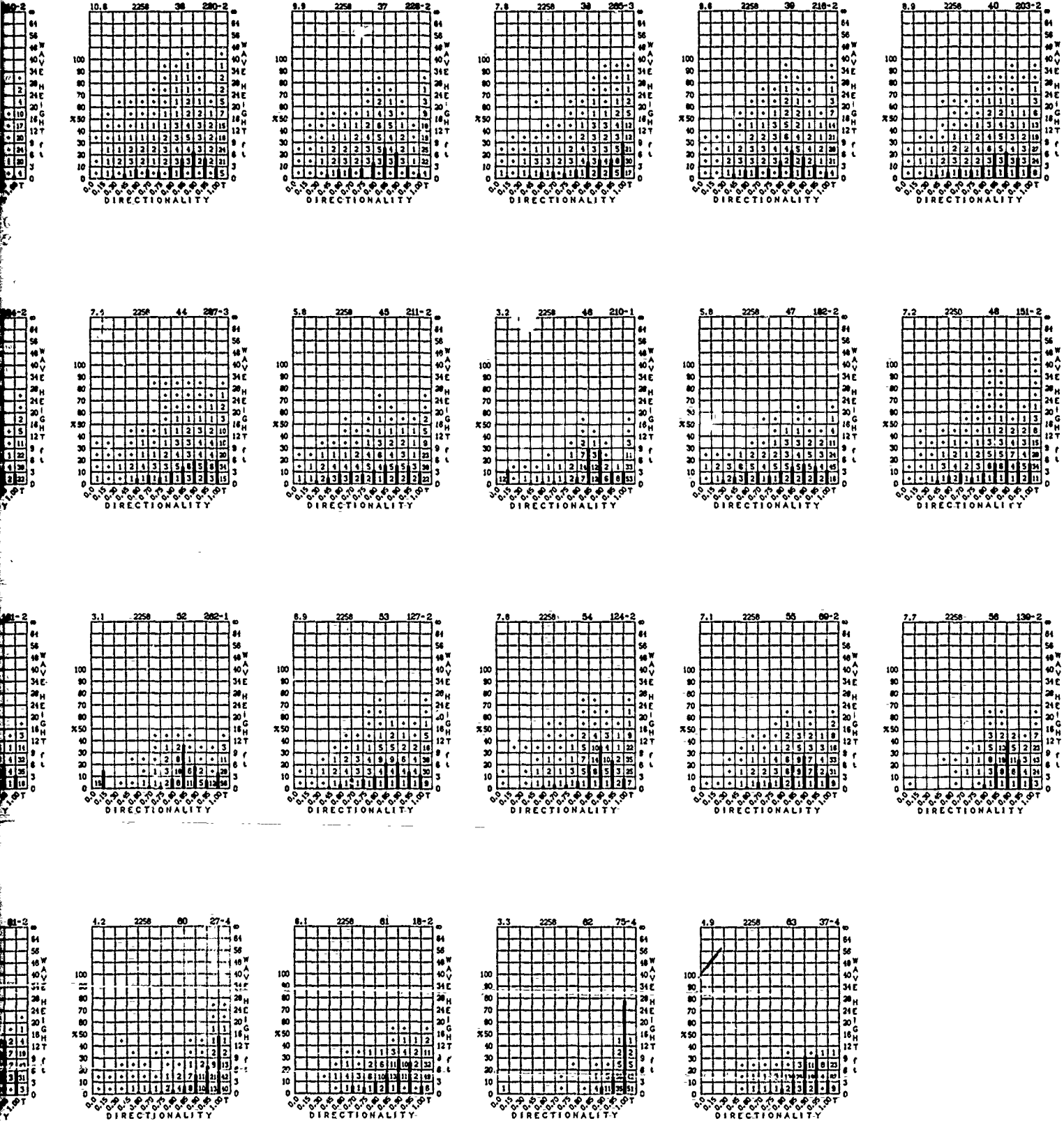


# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)



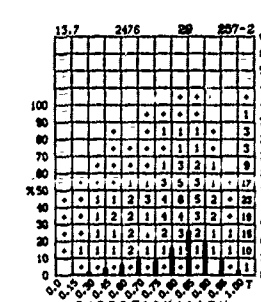
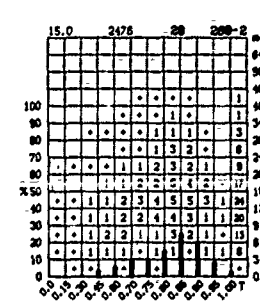
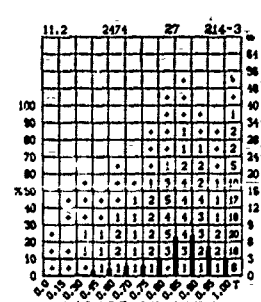
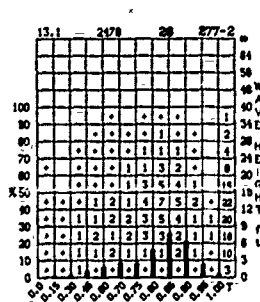
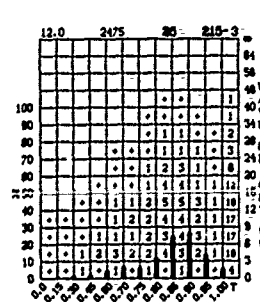
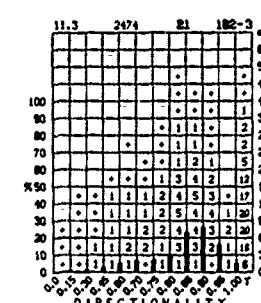
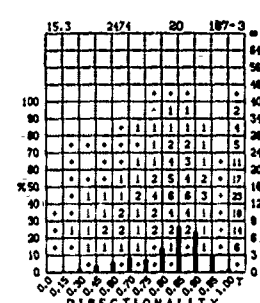
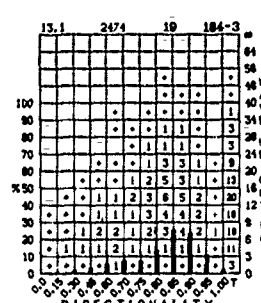
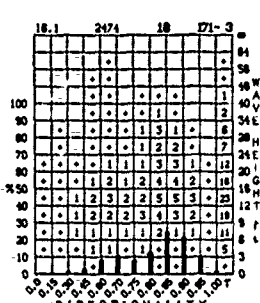
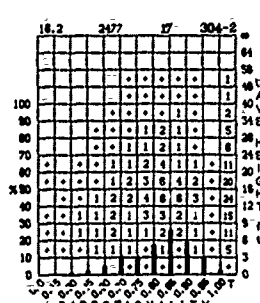
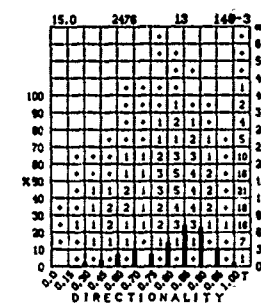
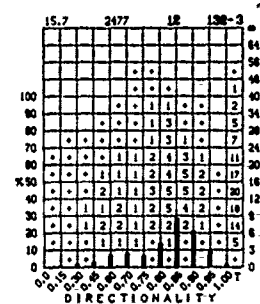
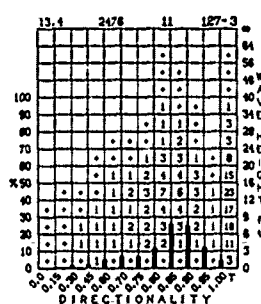
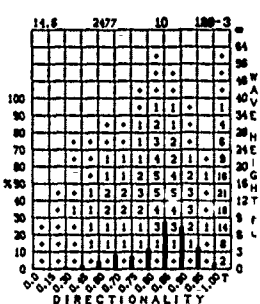
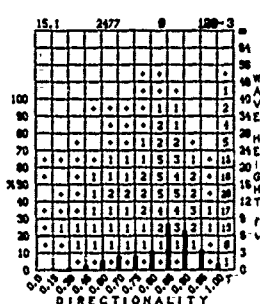
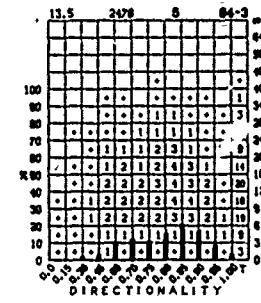
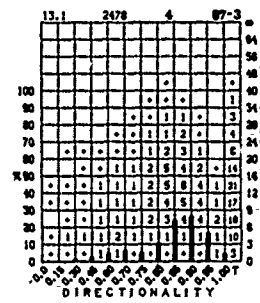
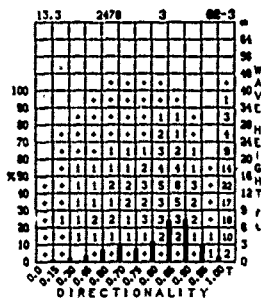
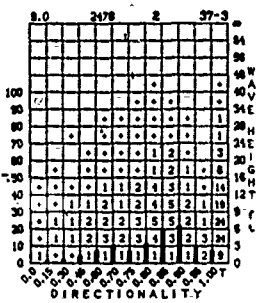
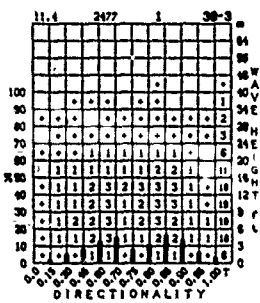
①



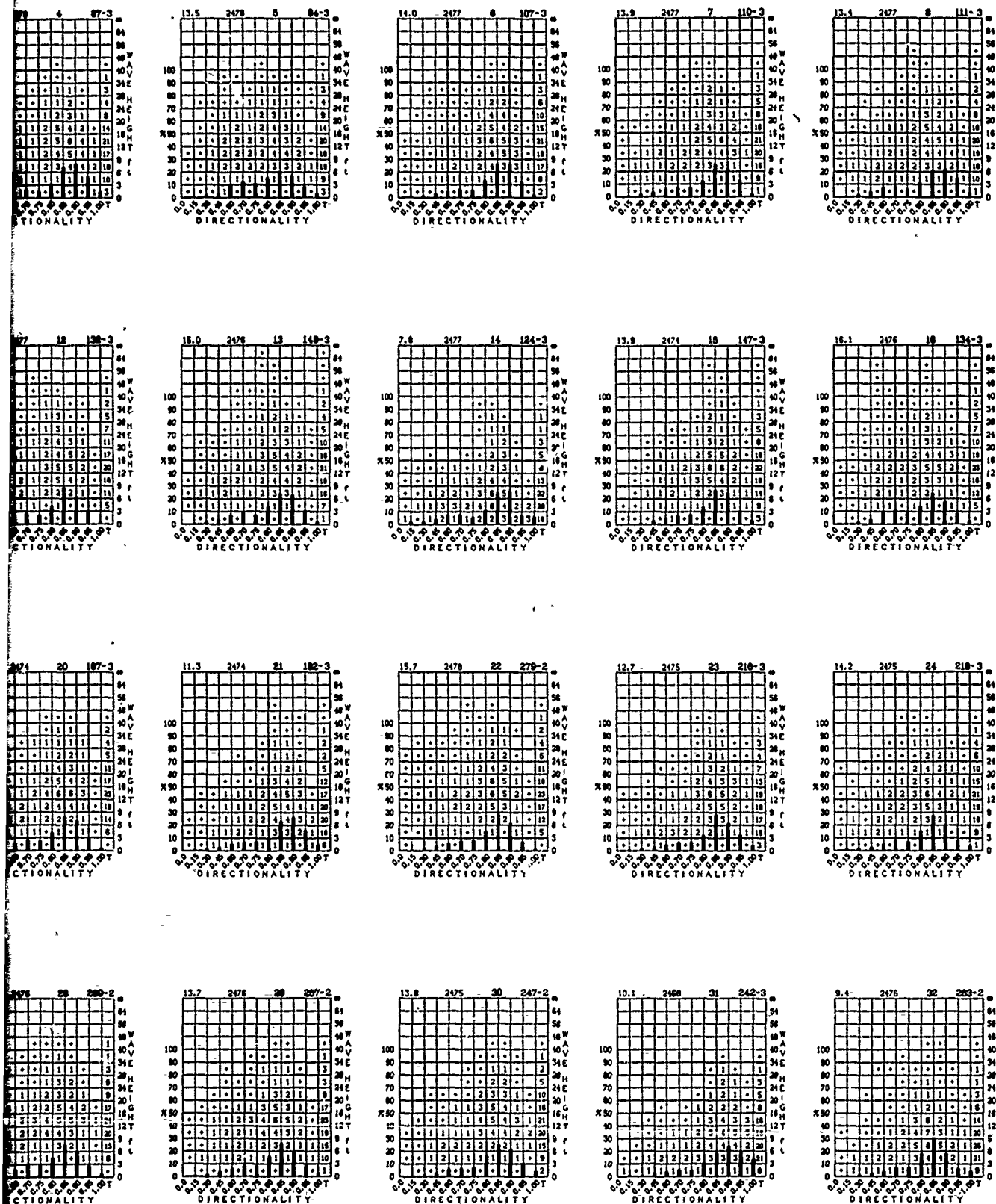


# MARCH

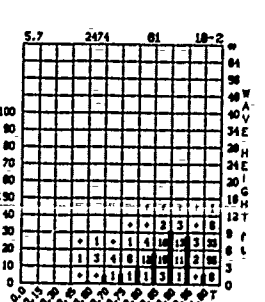
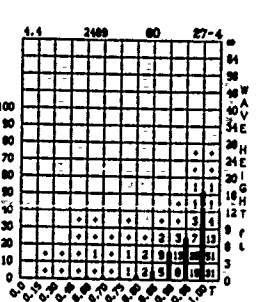
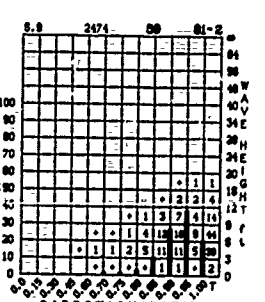
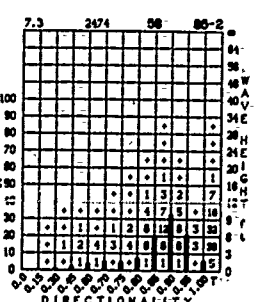
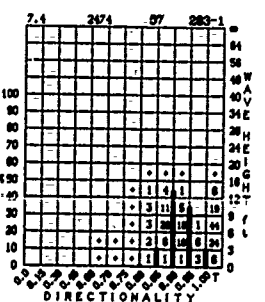
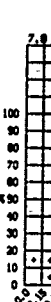
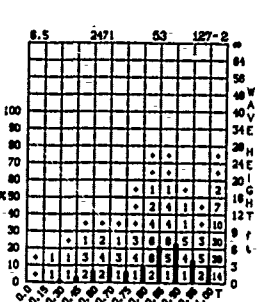
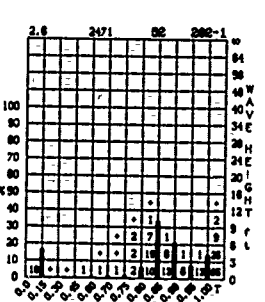
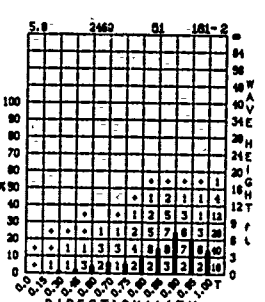
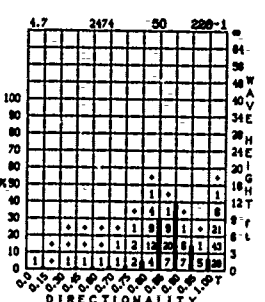
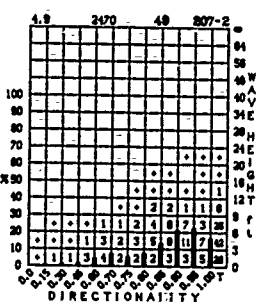
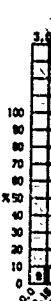
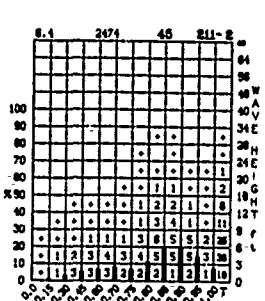
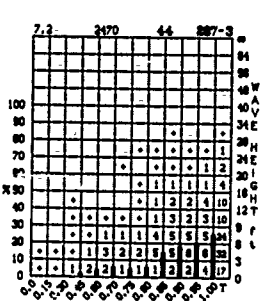
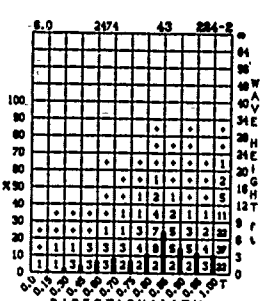
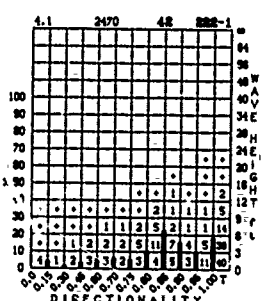
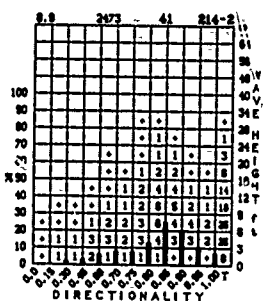
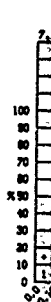
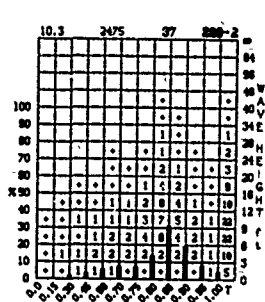
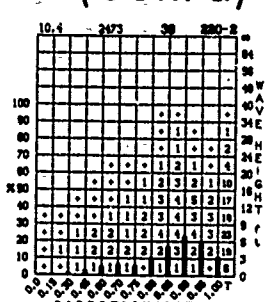
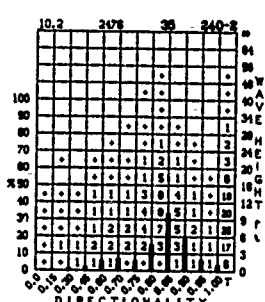
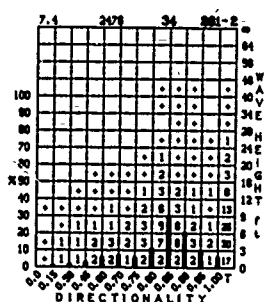
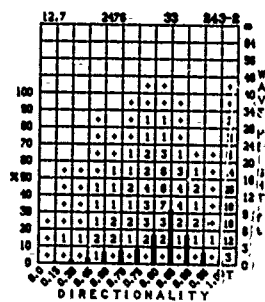
# WA



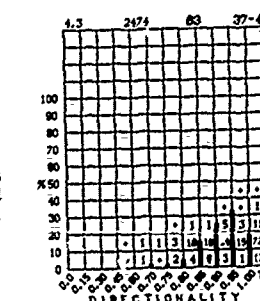
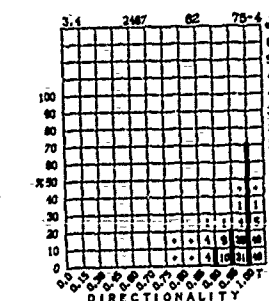
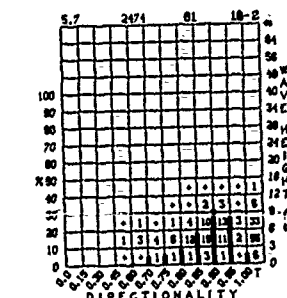
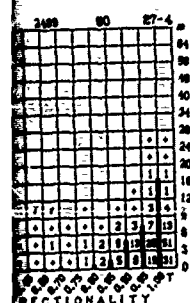
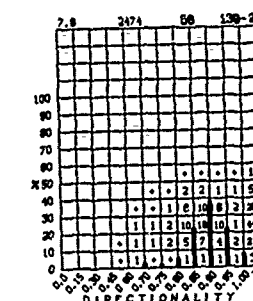
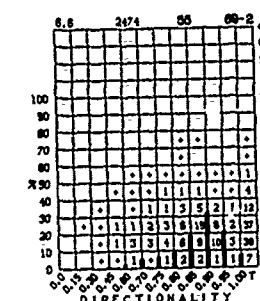
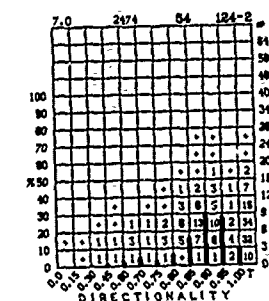
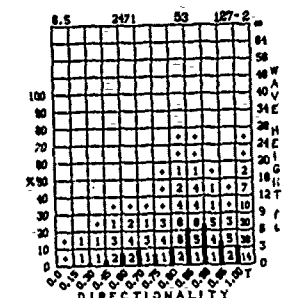
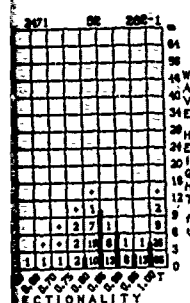
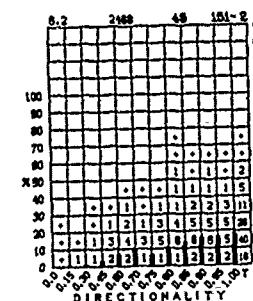
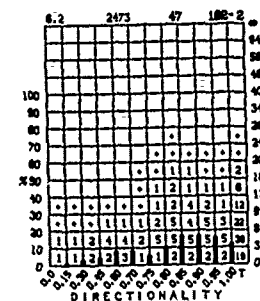
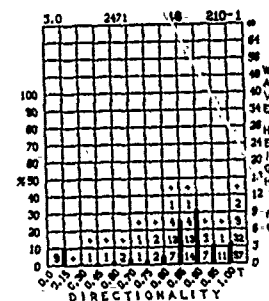
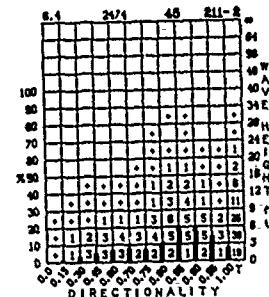
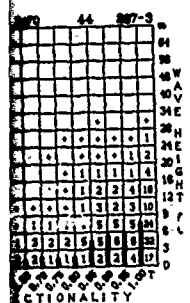
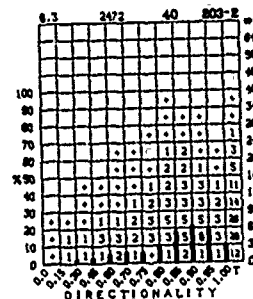
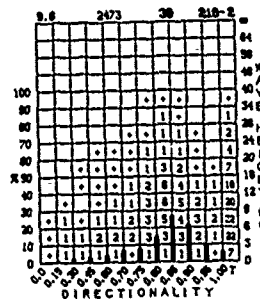
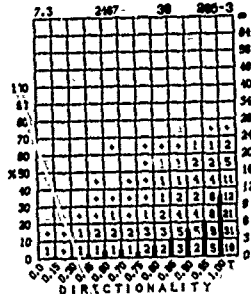
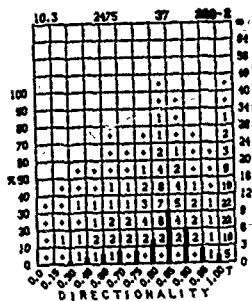
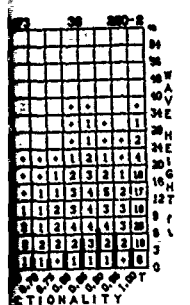
# WAVE HEIGHT AND DIRECTIONALITY



# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)

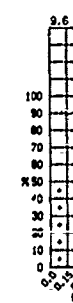
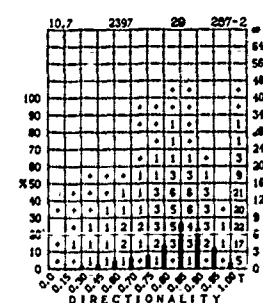
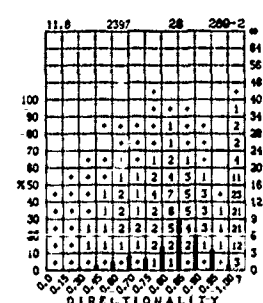
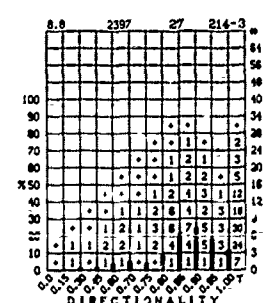
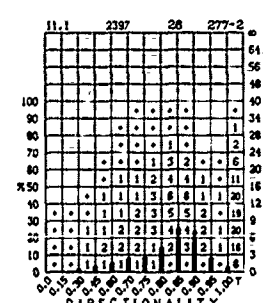
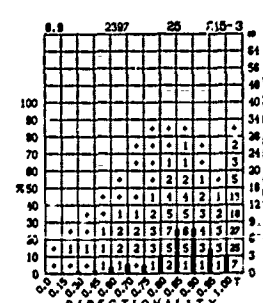
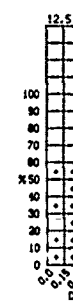
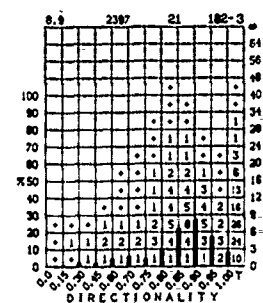
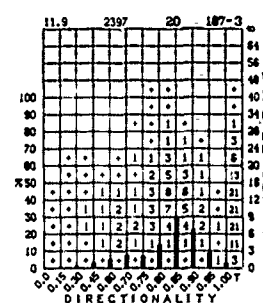
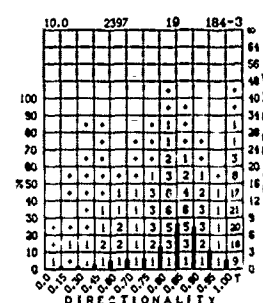
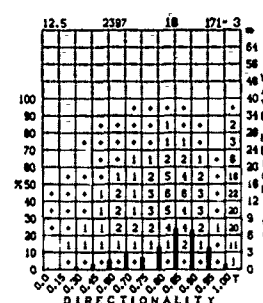
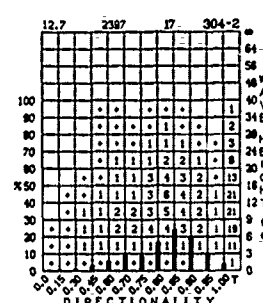
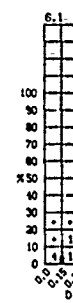
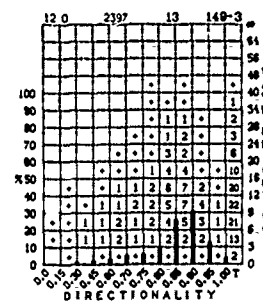
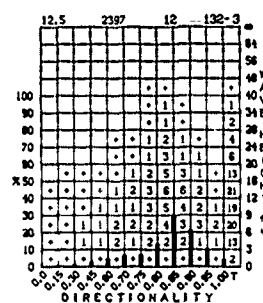
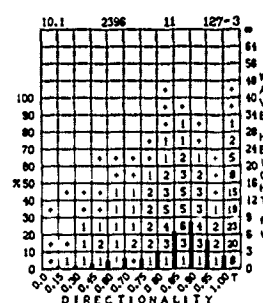
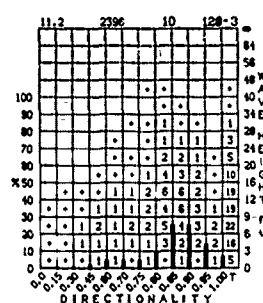
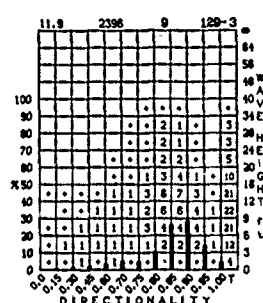
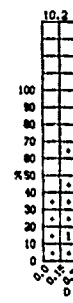
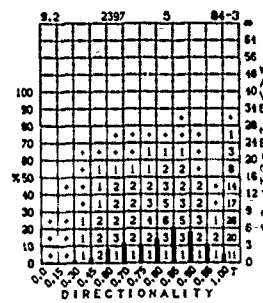
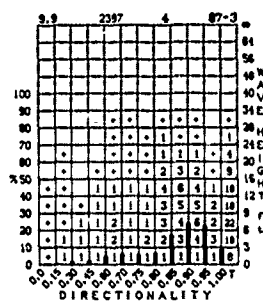
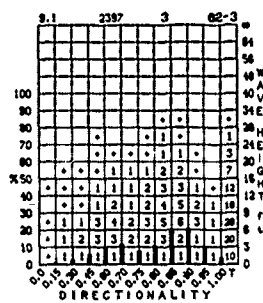
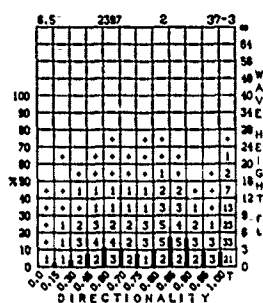
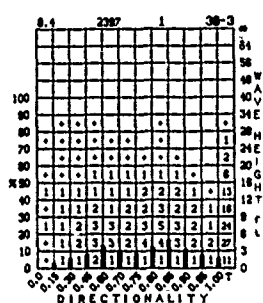


MARCH



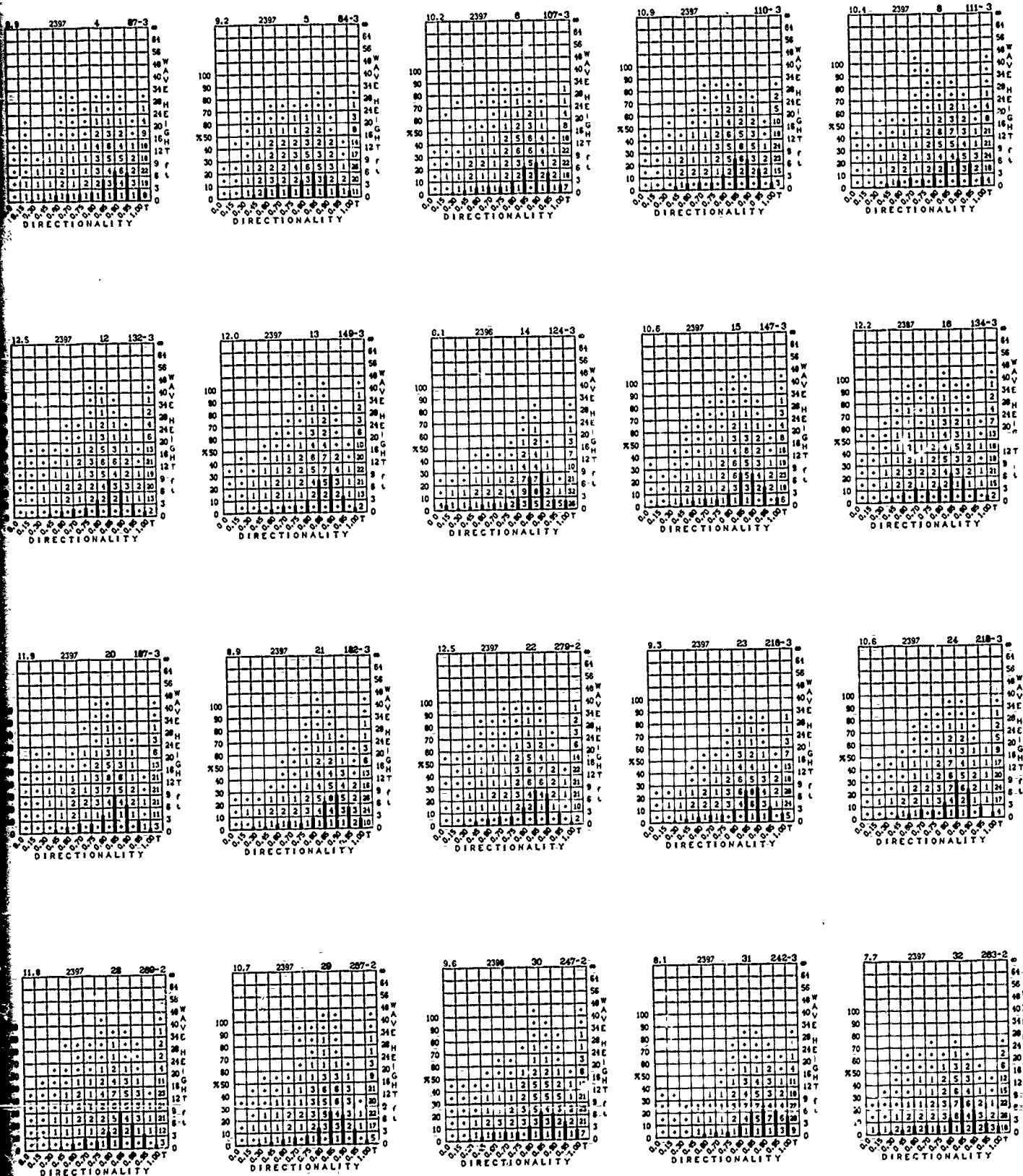
# APRIL

# WAVE



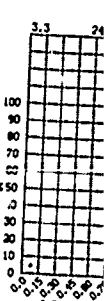
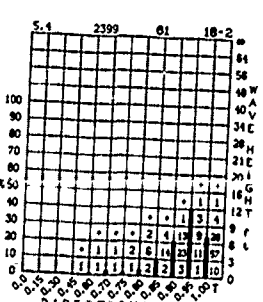
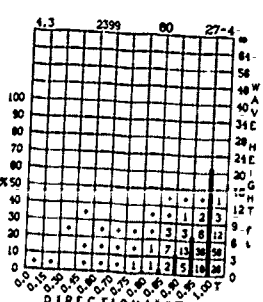
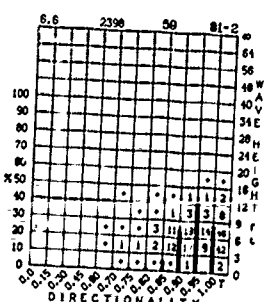
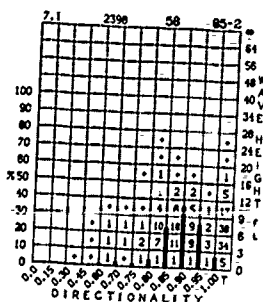
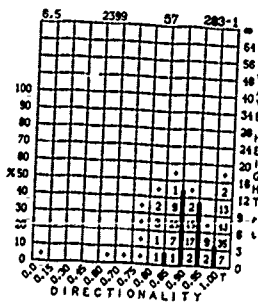
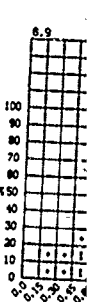
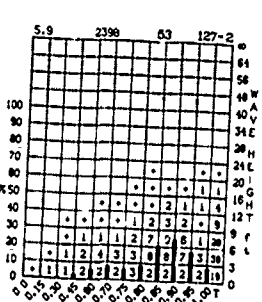
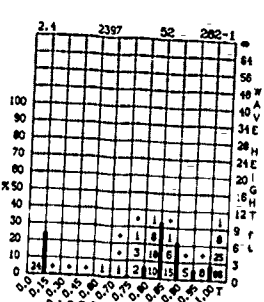
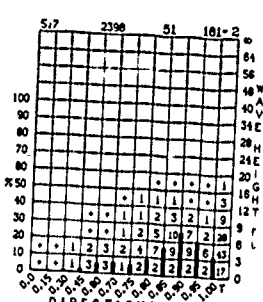
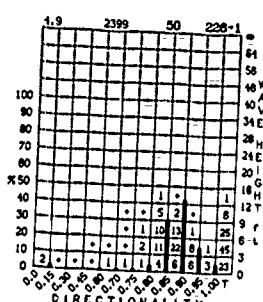
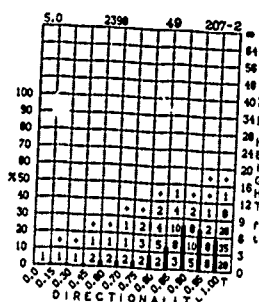
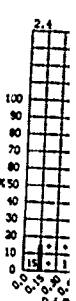
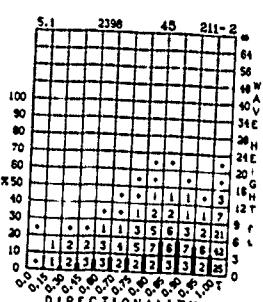
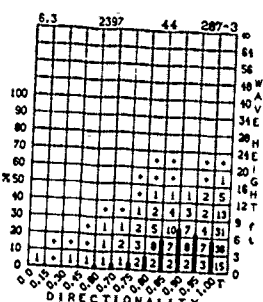
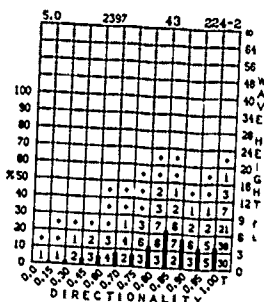
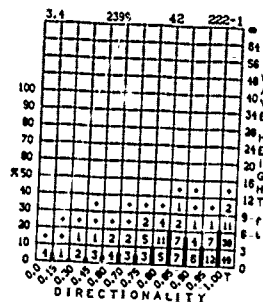
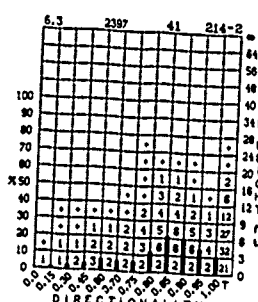
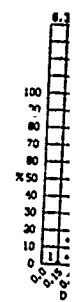
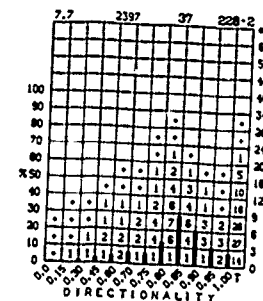
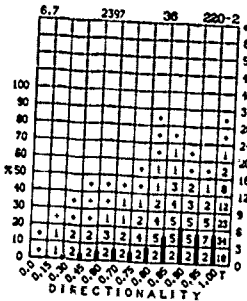
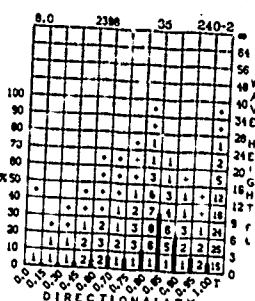
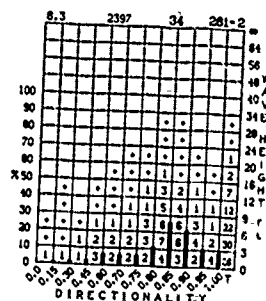
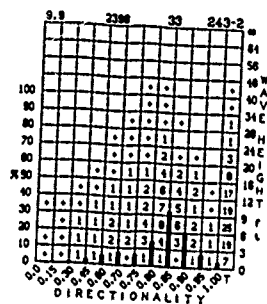


# WAVE HEIGHT AND DIRECTIONALITY

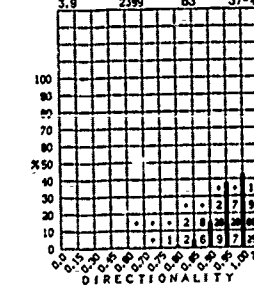
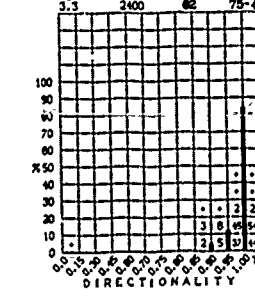
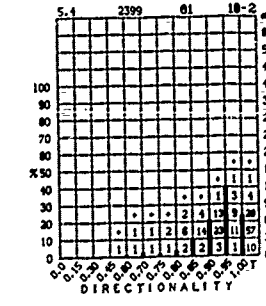
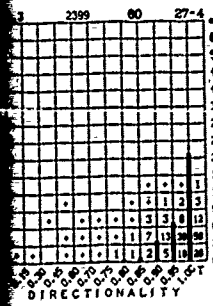
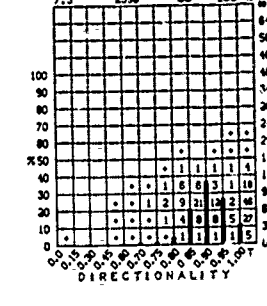
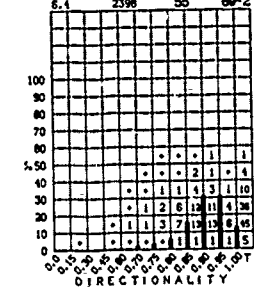
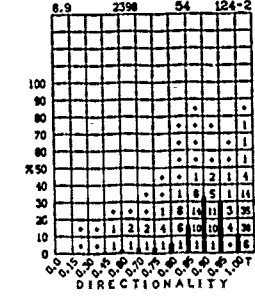
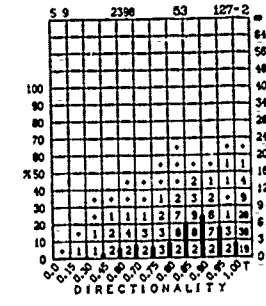
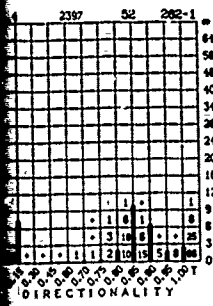
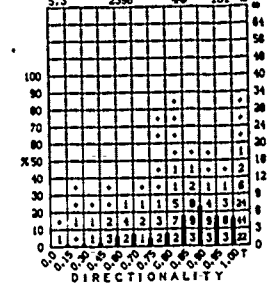
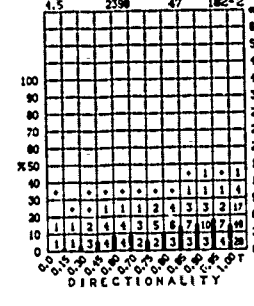
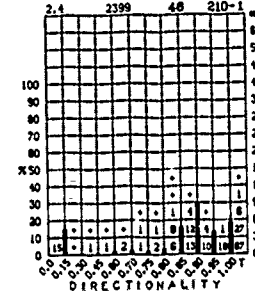
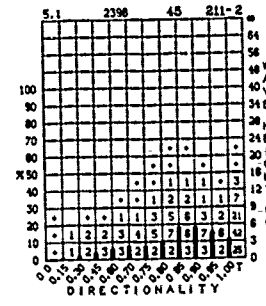
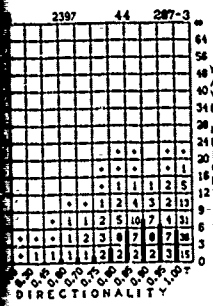
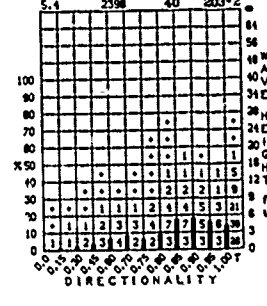
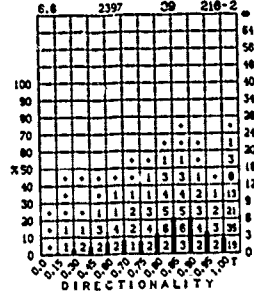
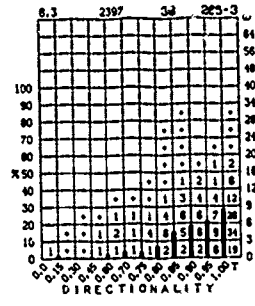
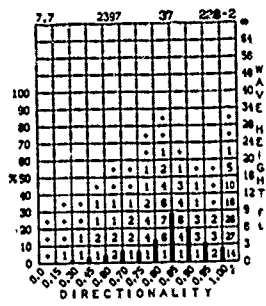
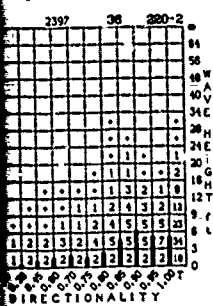




# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)

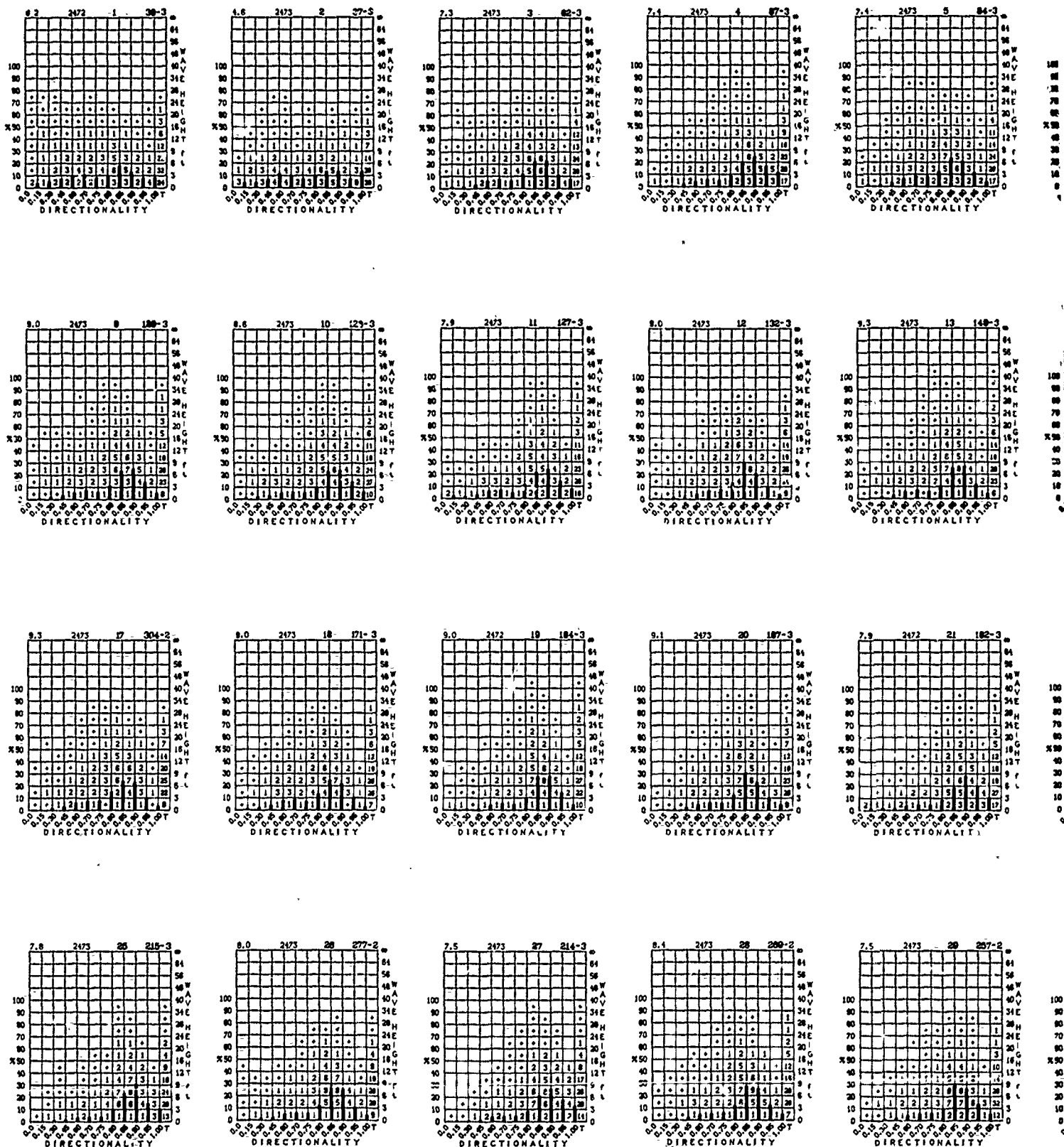


APRIL

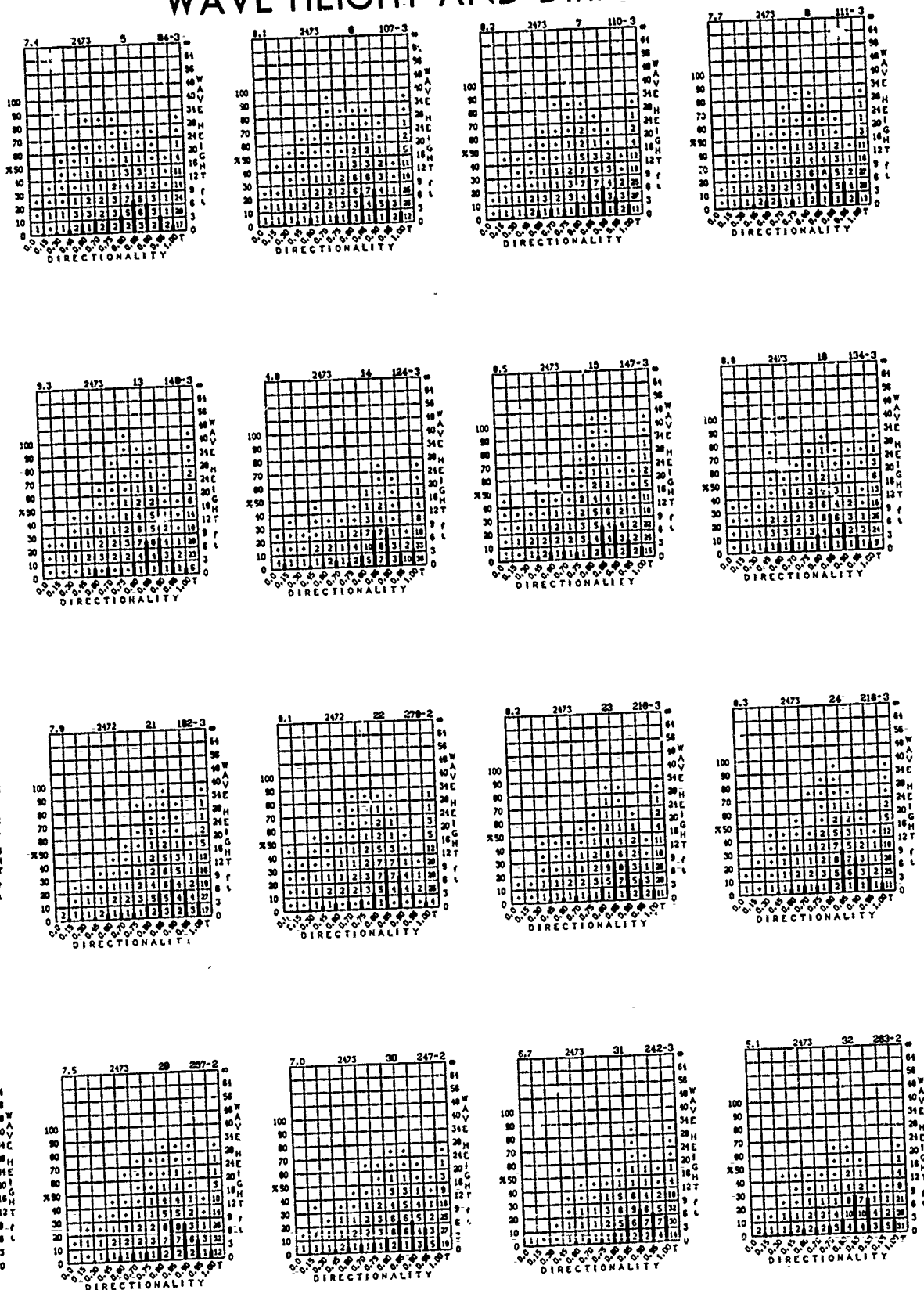


# MAY

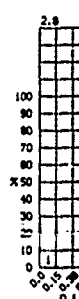
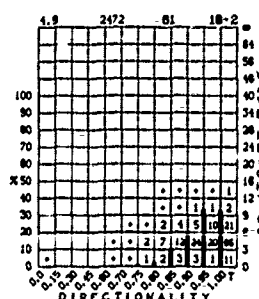
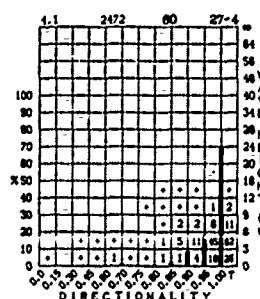
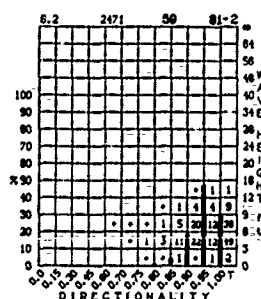
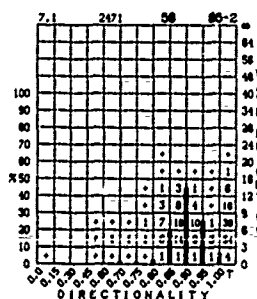
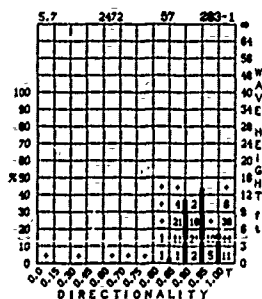
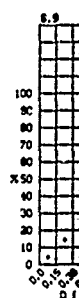
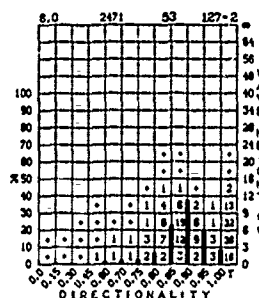
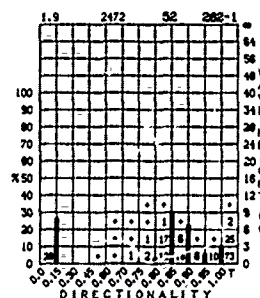
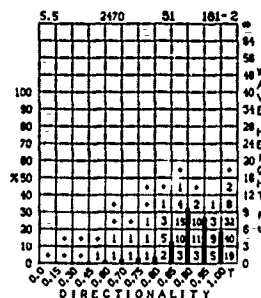
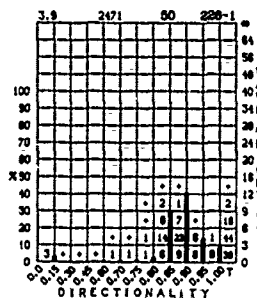
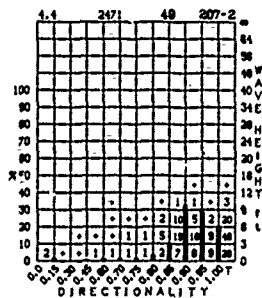
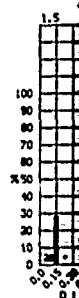
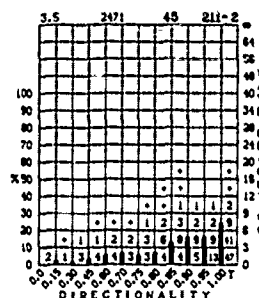
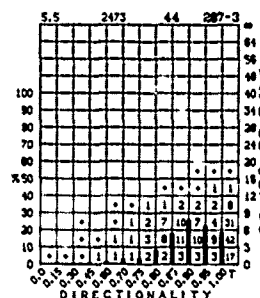
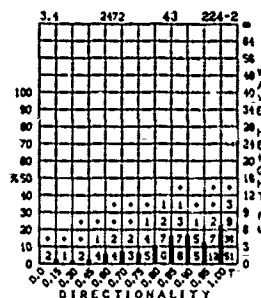
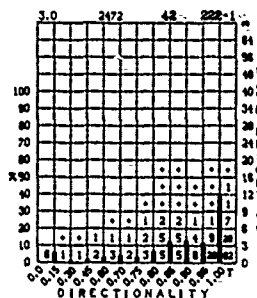
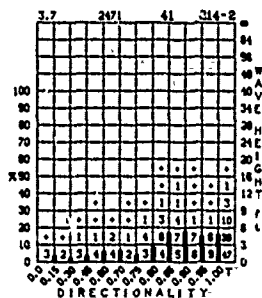
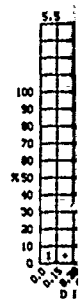
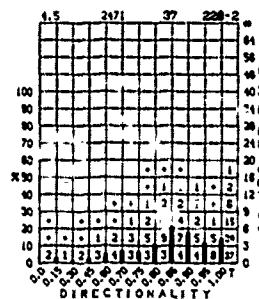
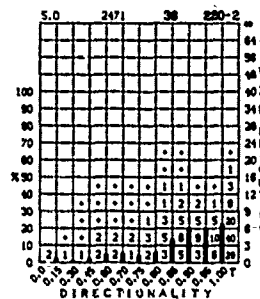
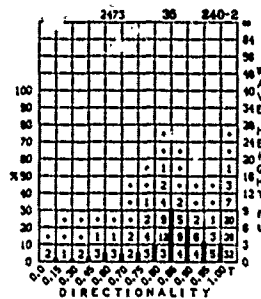
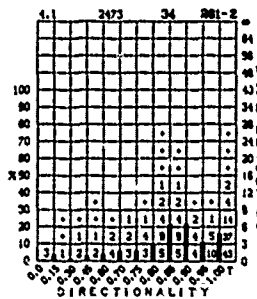
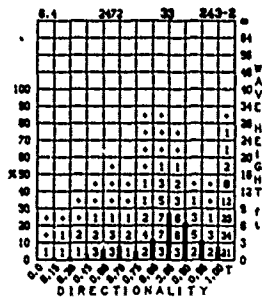
# WAY



# WAVE HEIGHT AND DIRECTIONALITY

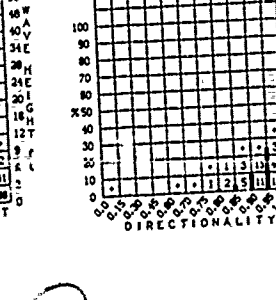
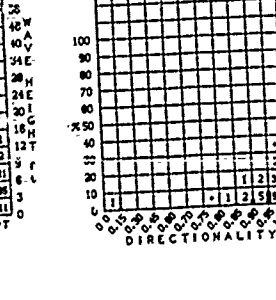
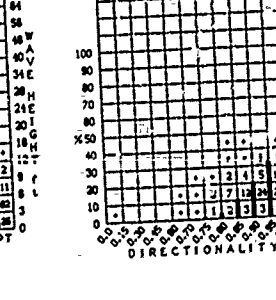
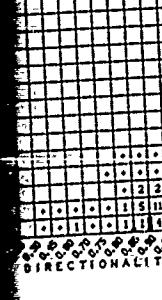
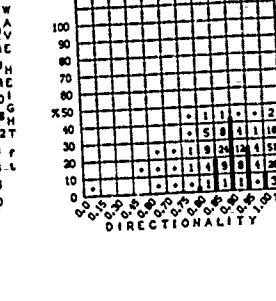
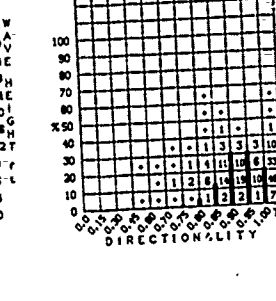
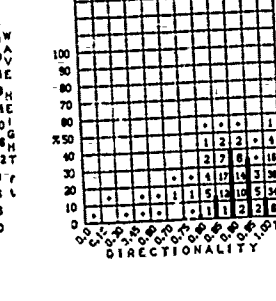
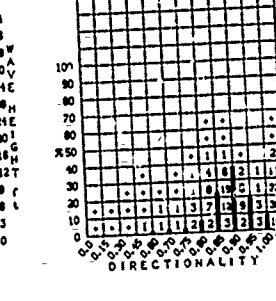
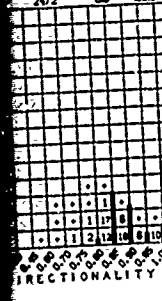
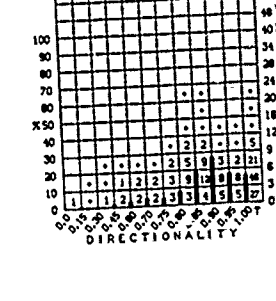
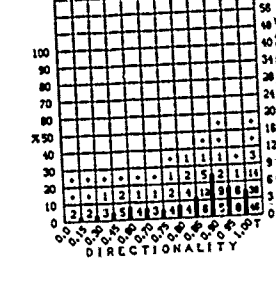
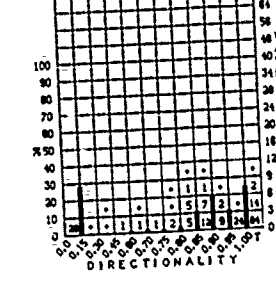
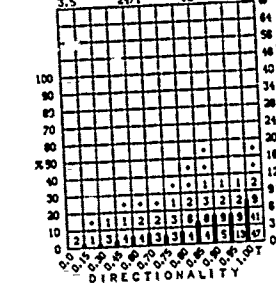
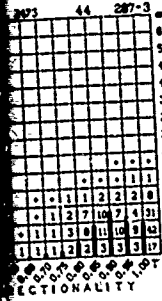
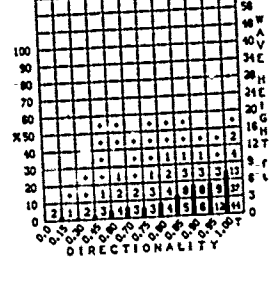
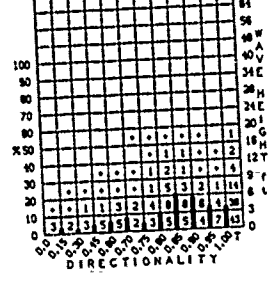
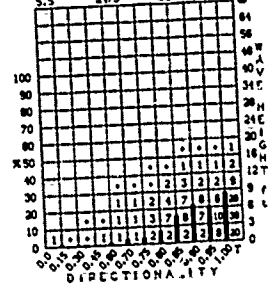
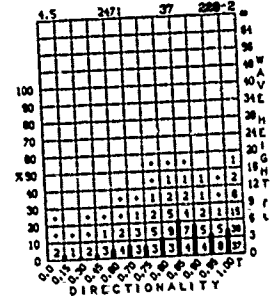
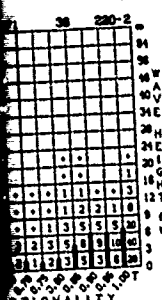


# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)



Cont'd)

MAY

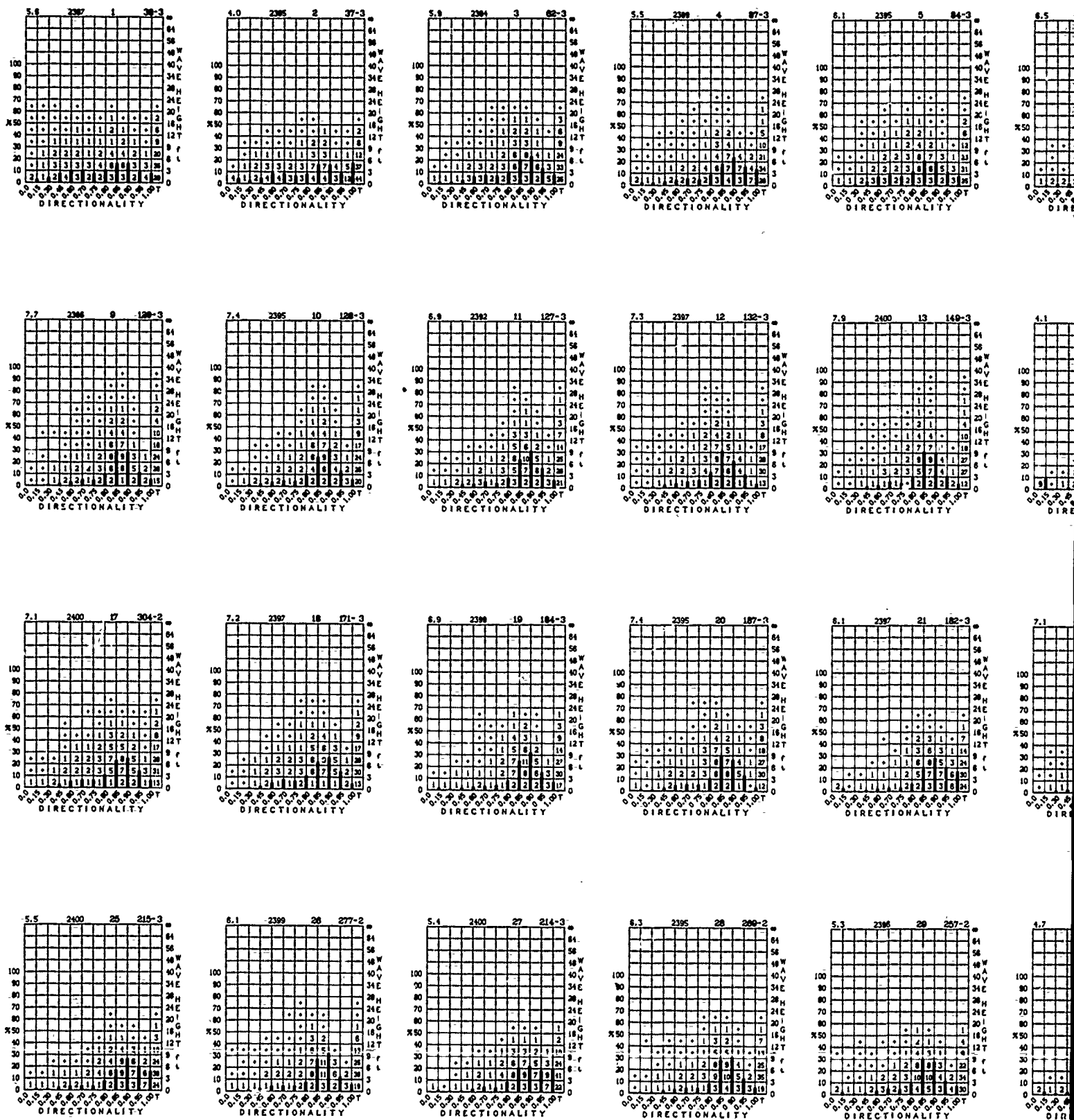


(2)



# JUNE

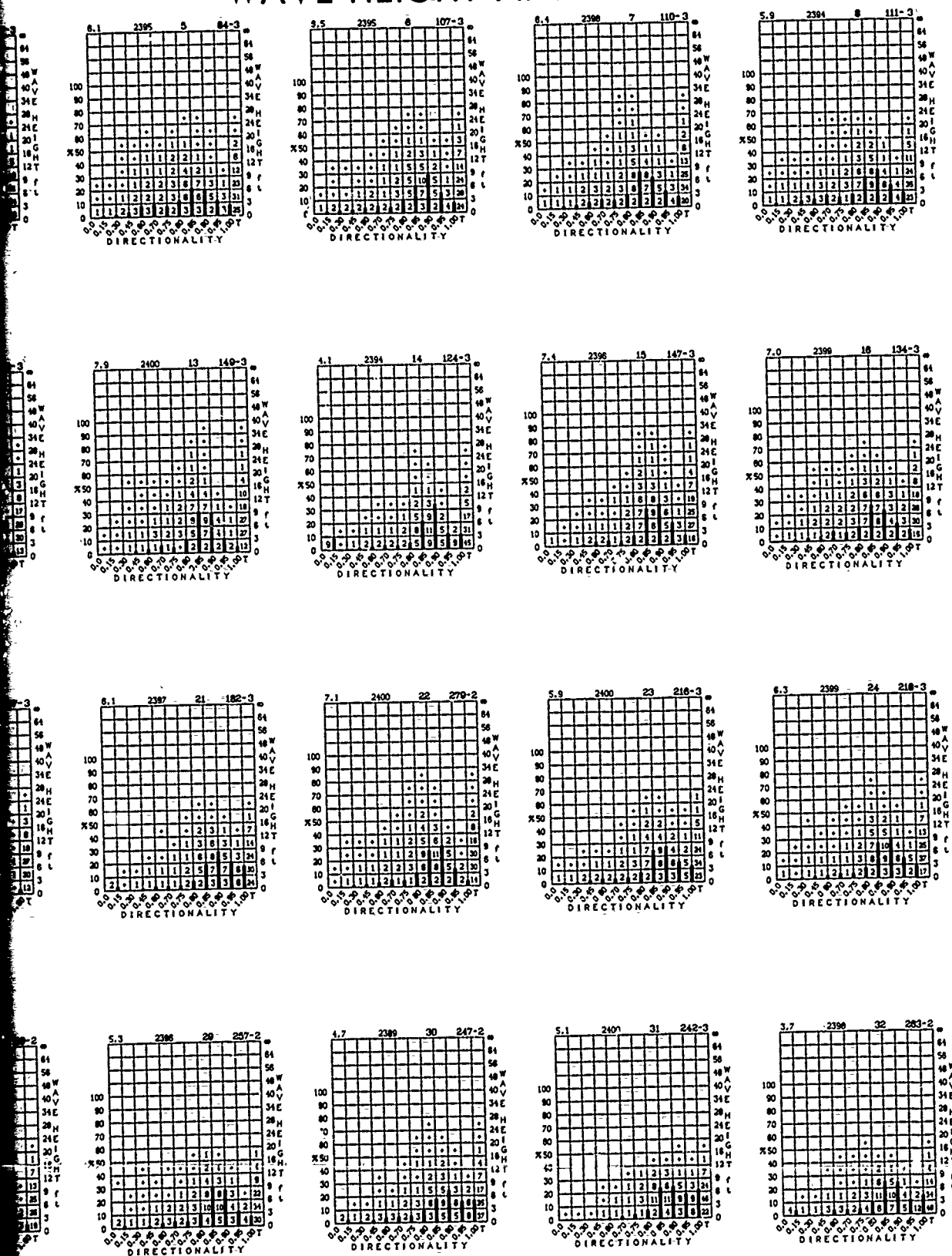
# WAVE I



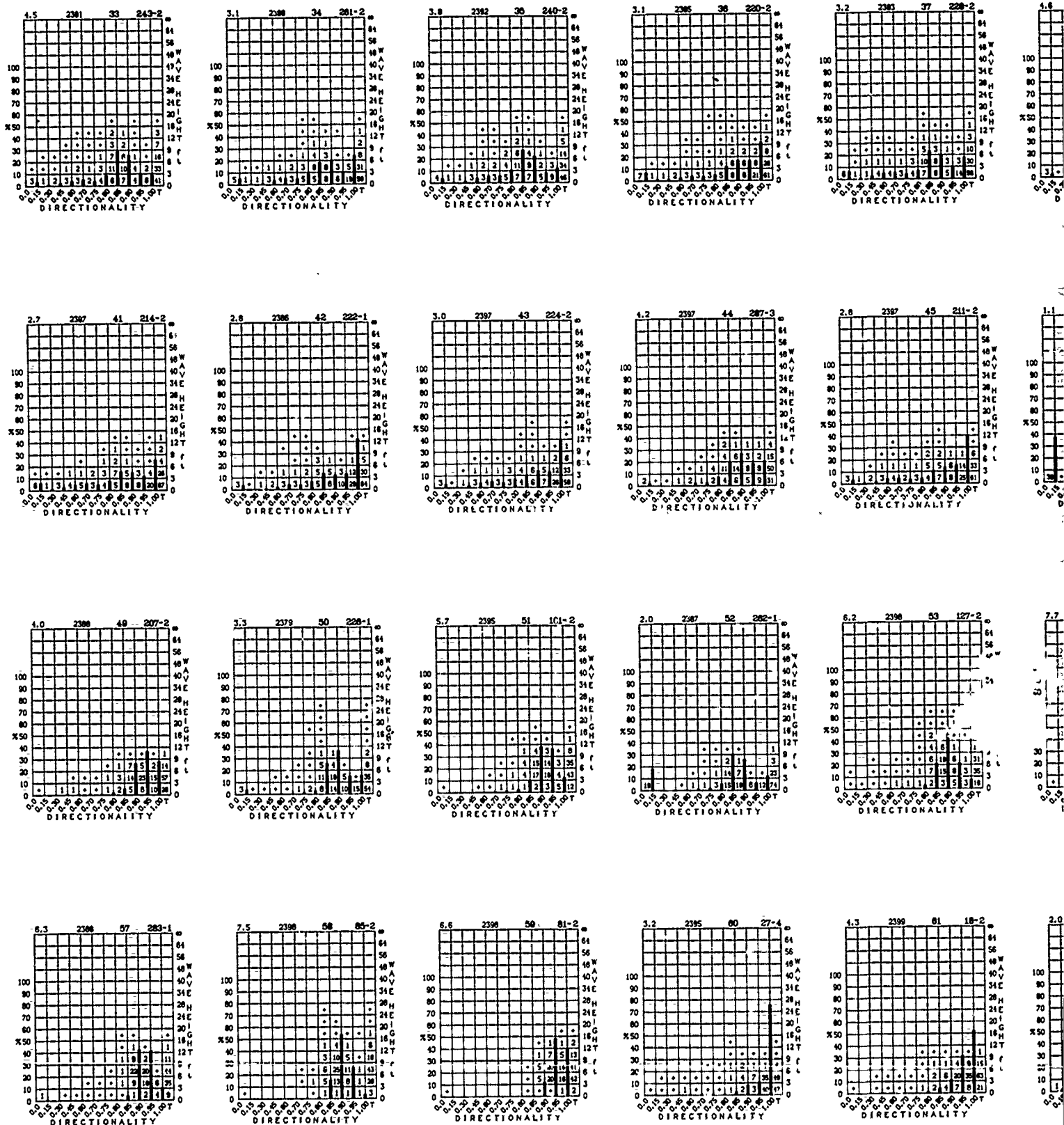
①



# WAVE HEIGHT AND DIRECTIONALITY

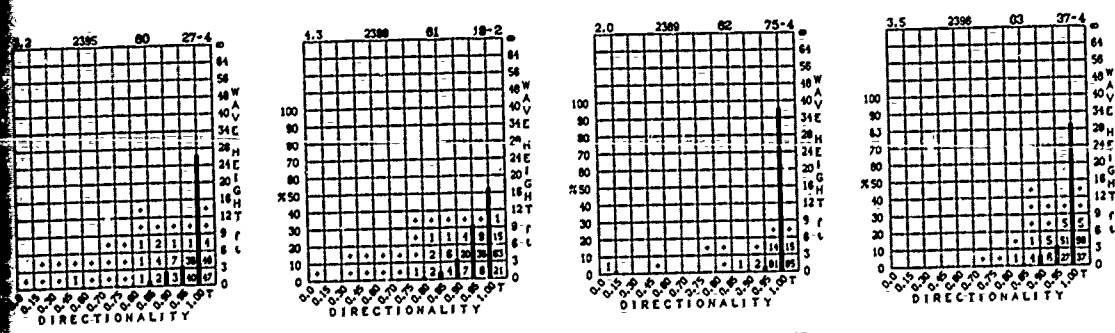
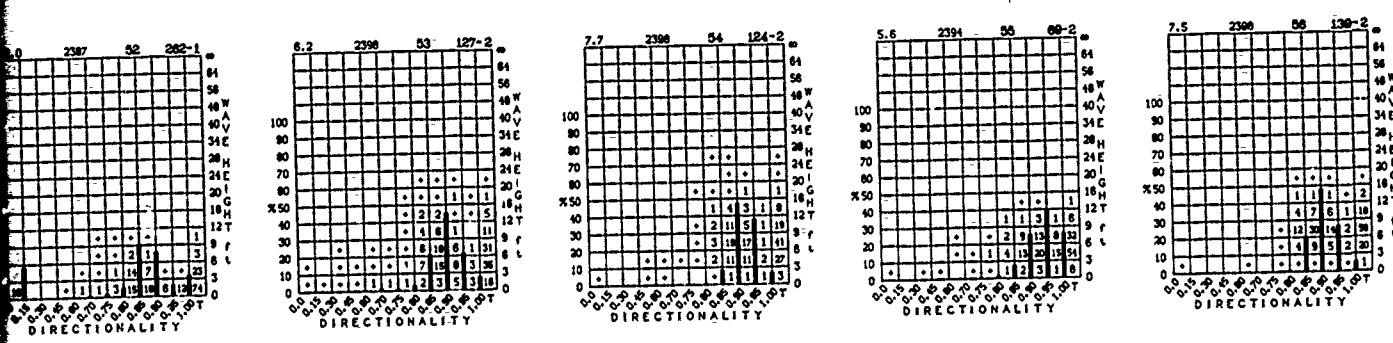
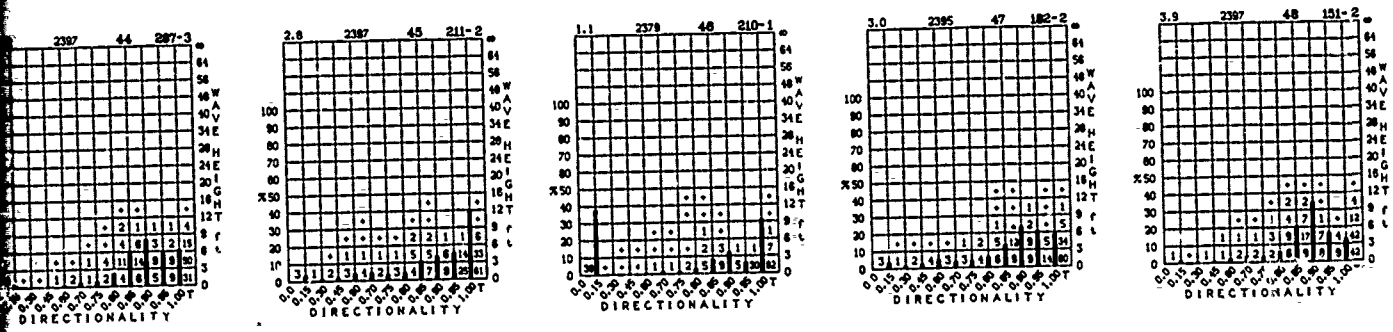
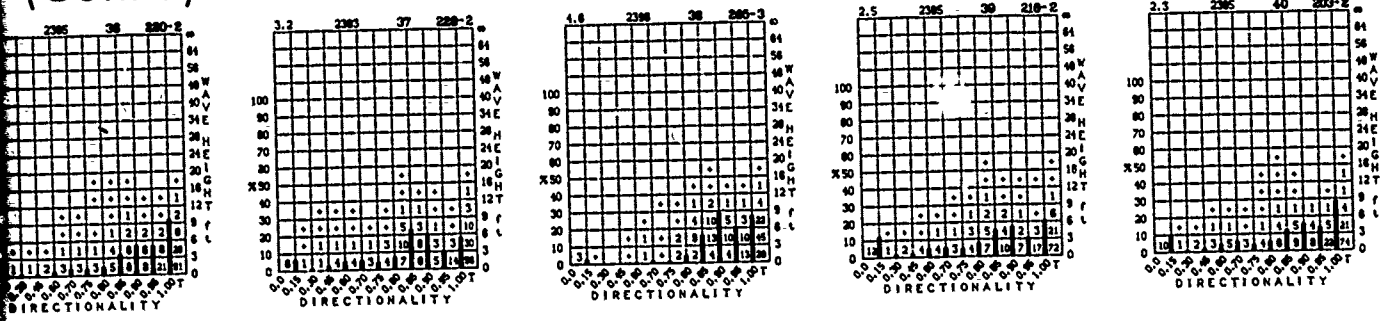


# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)



(Cont'd)

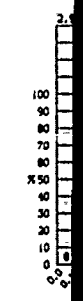
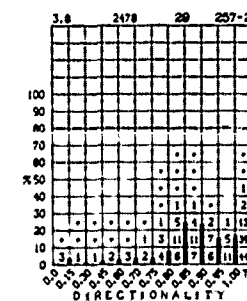
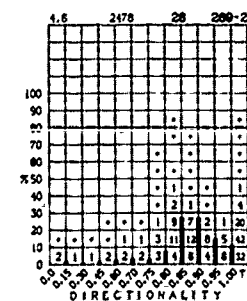
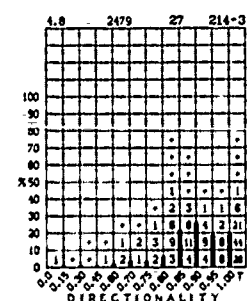
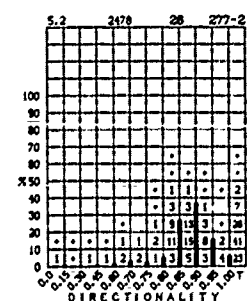
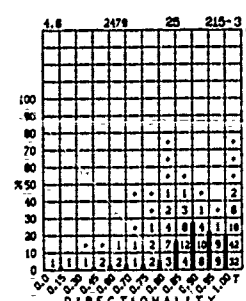
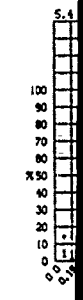
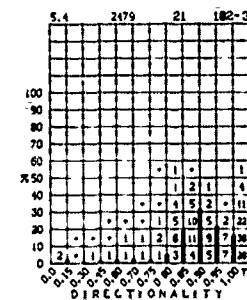
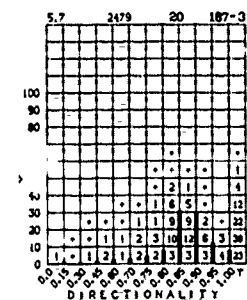
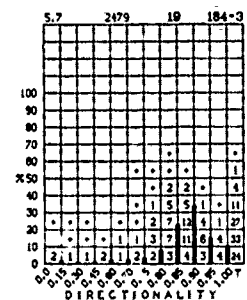
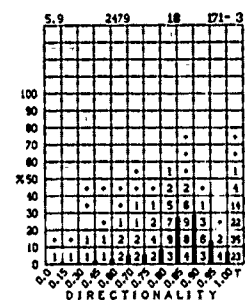
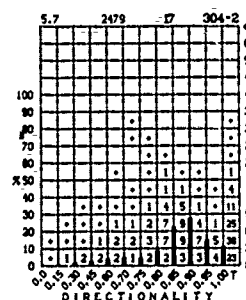
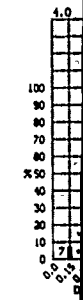
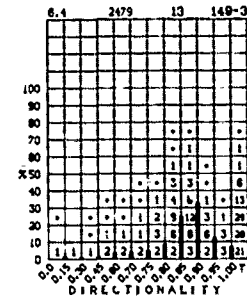
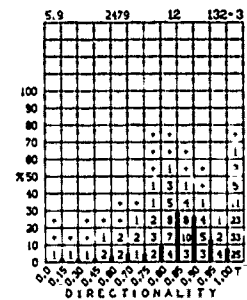
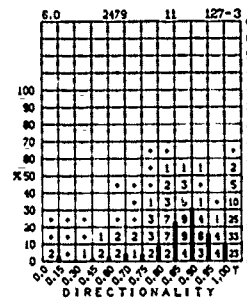
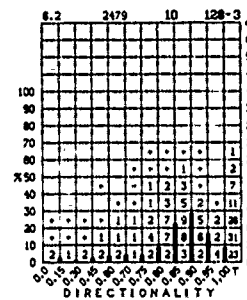
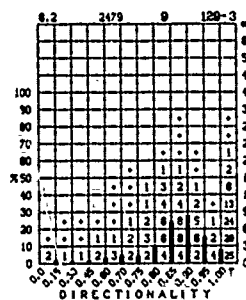
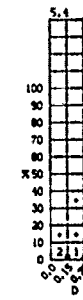
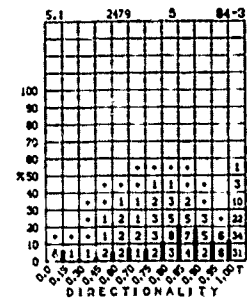
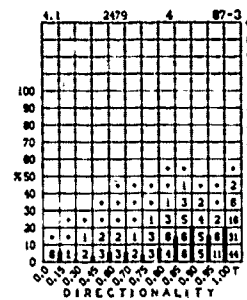
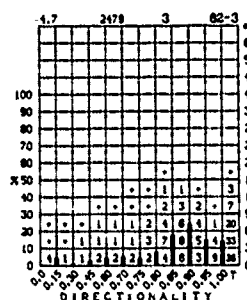
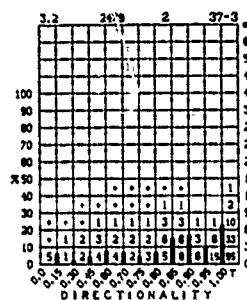
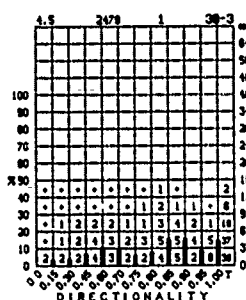
JUNE



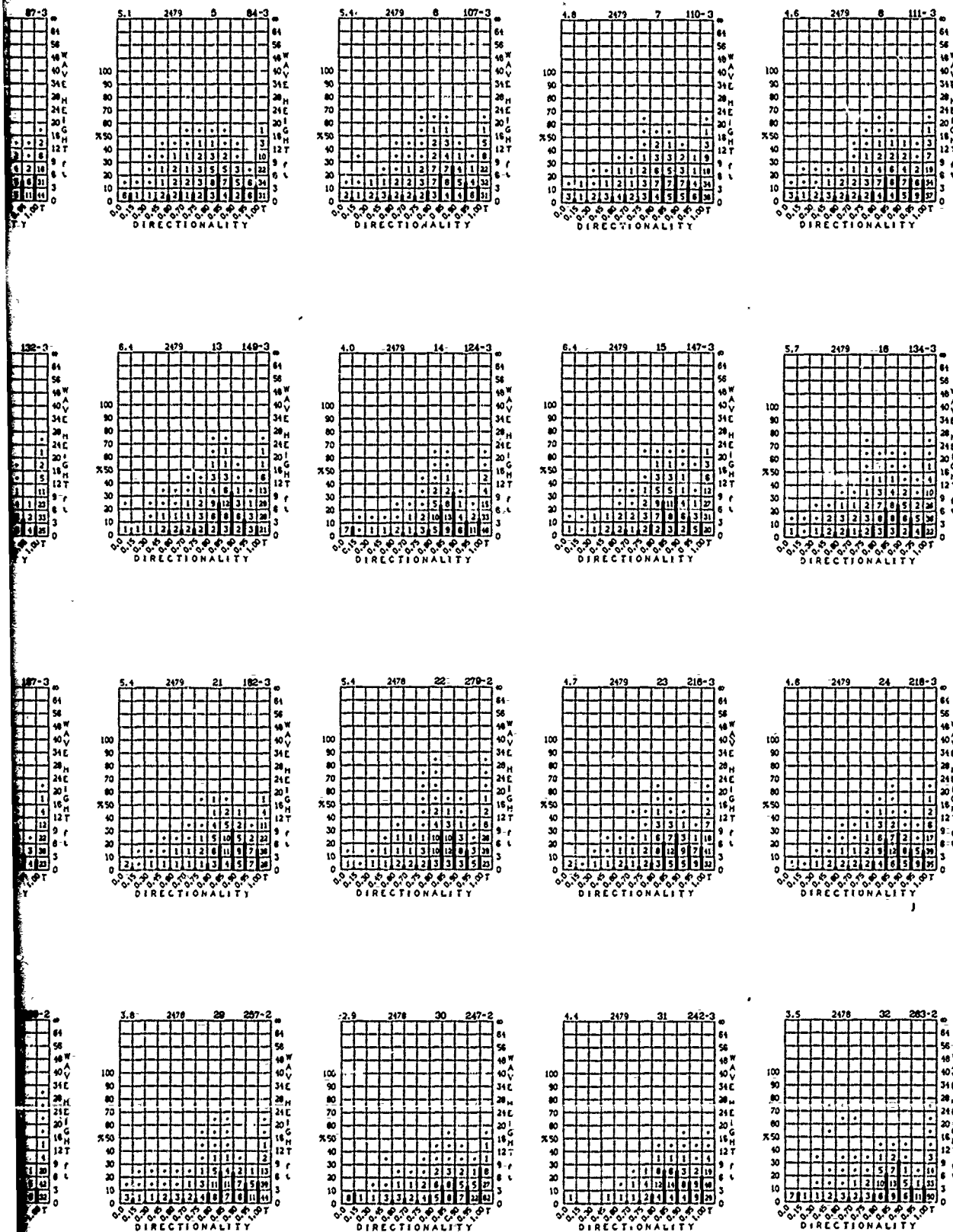
(2)

# JULY

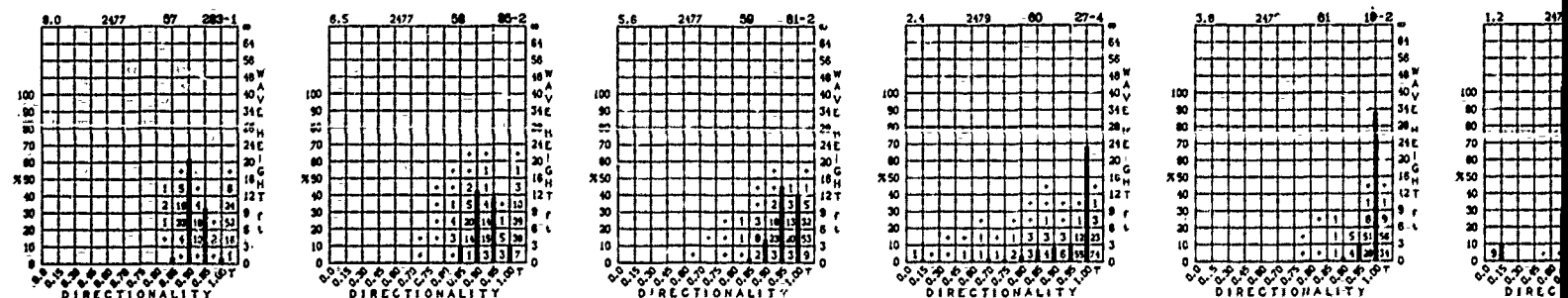
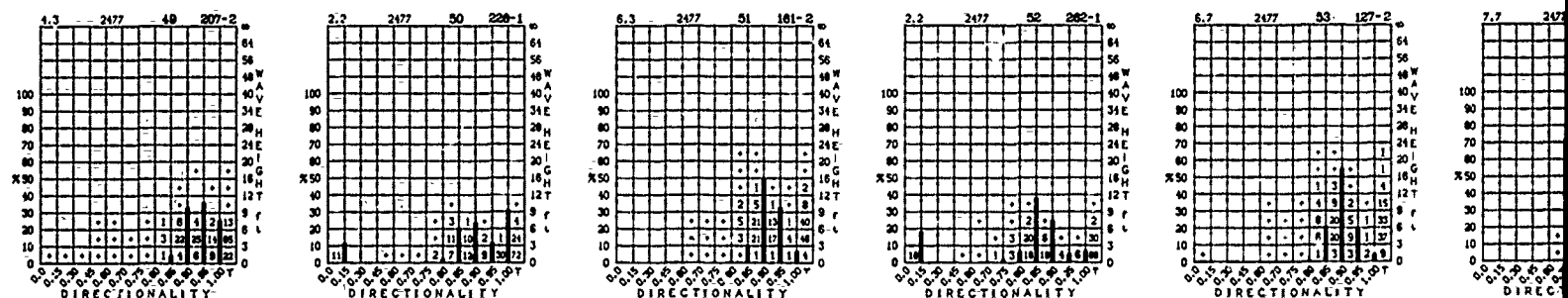
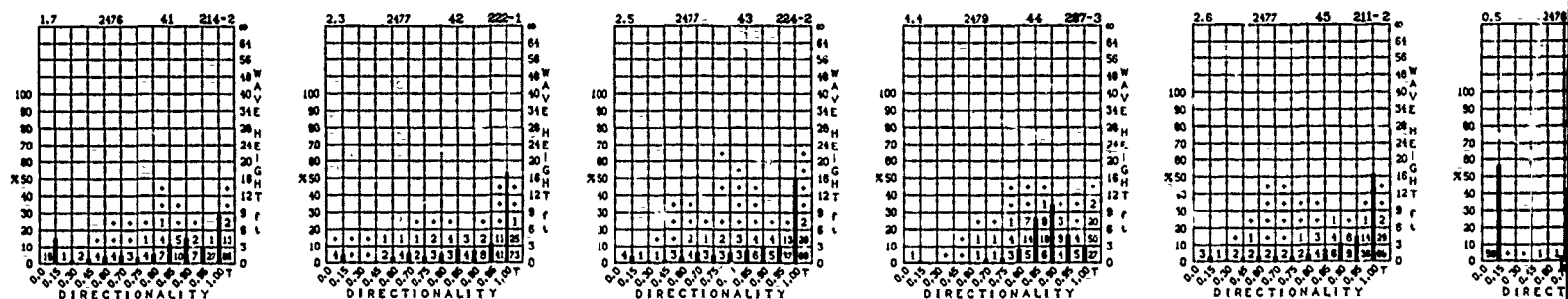
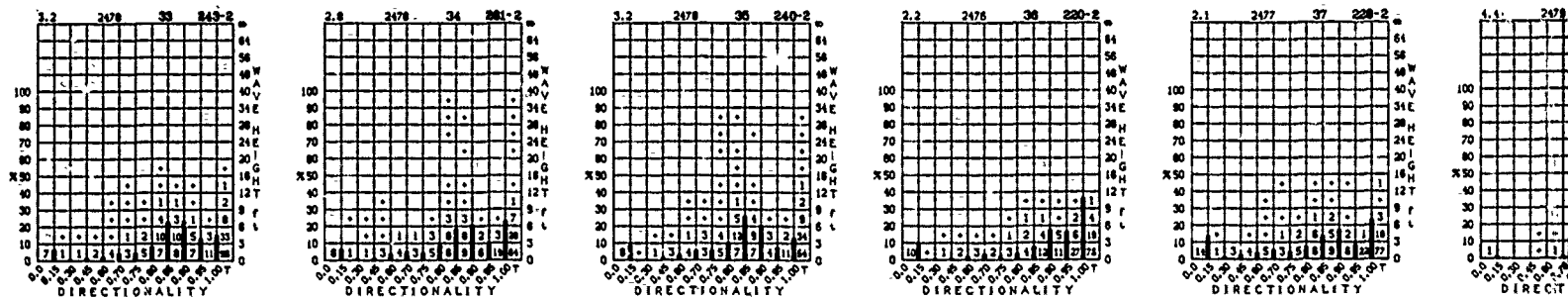
# WAVE



# WAVE HEIGHT AND DIRECTIONALITY

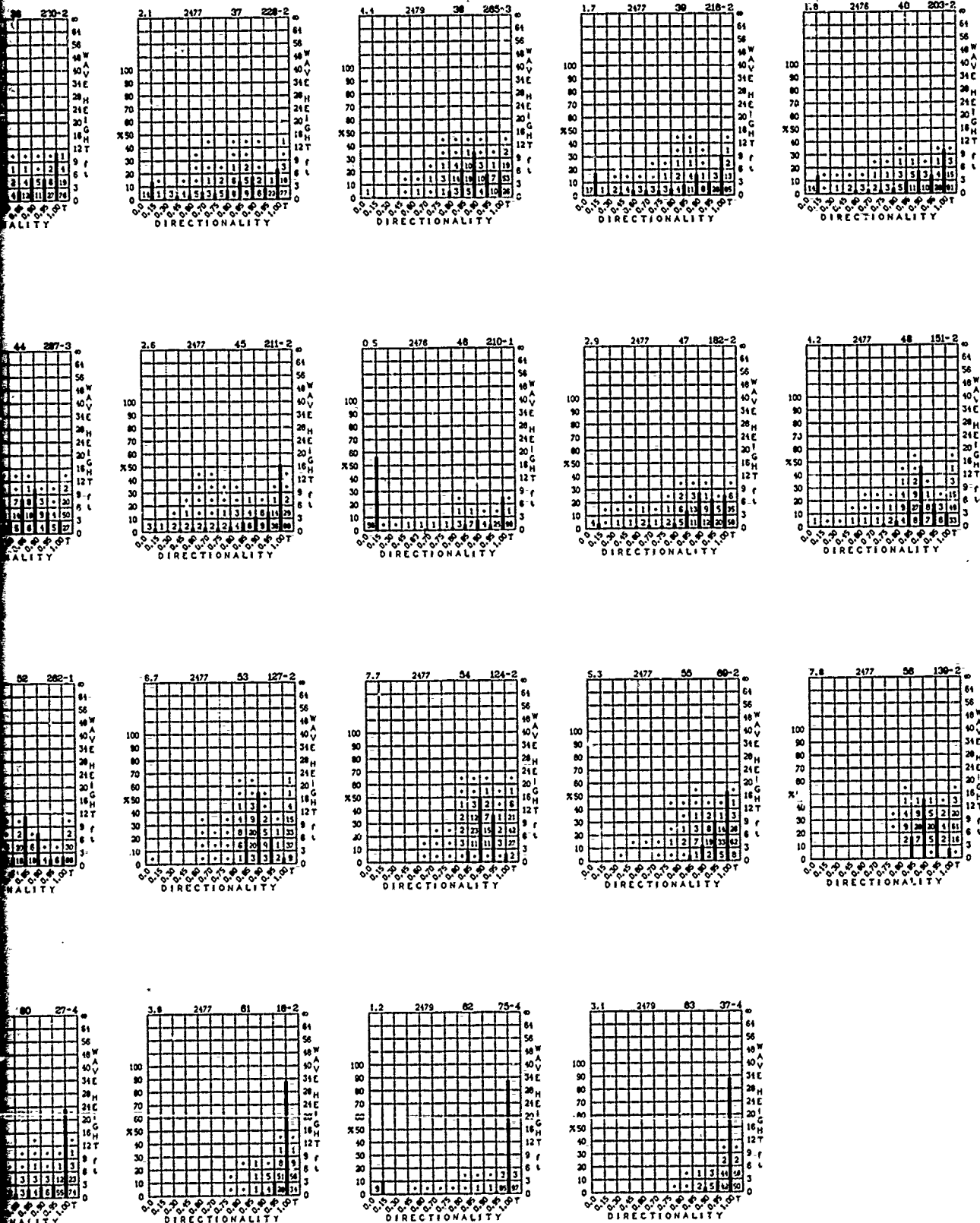


# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)



nt'd)

JULY

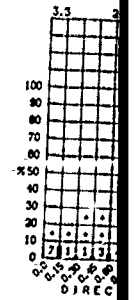
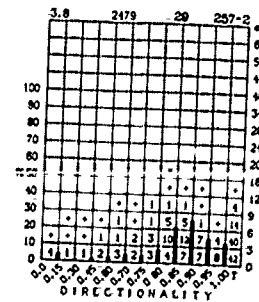
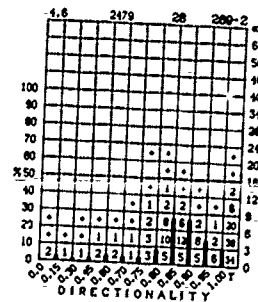
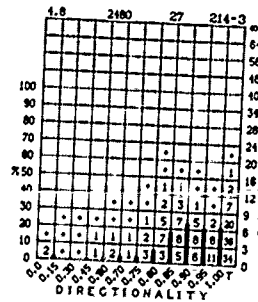
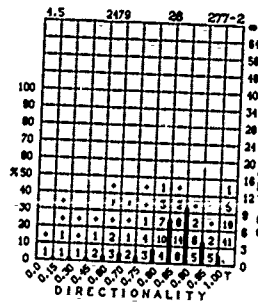
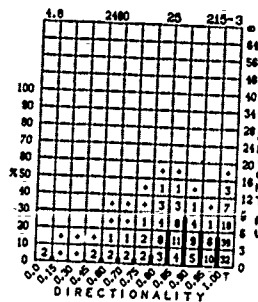
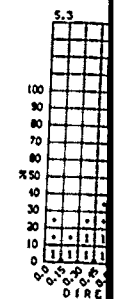
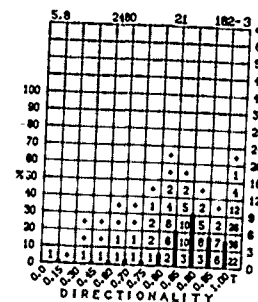
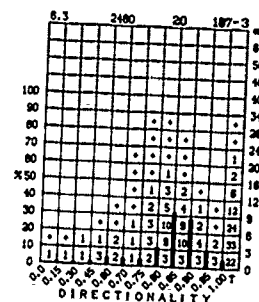
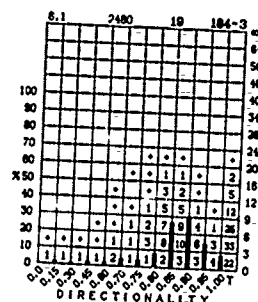
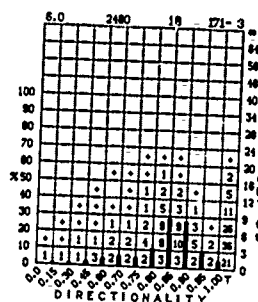
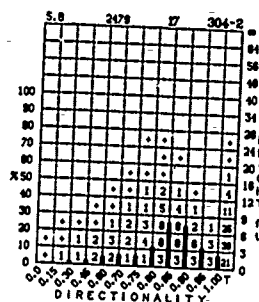
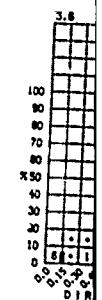
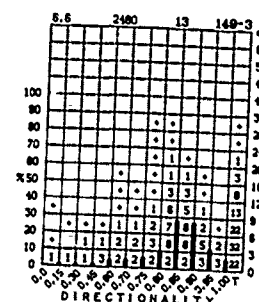
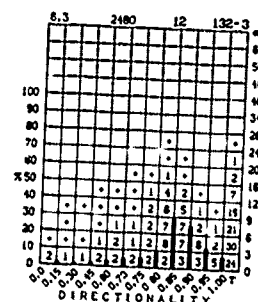
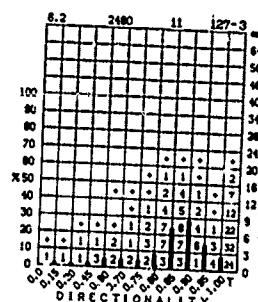
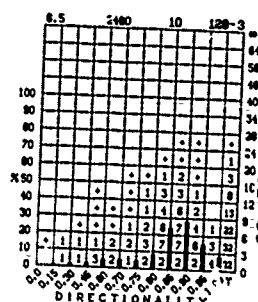
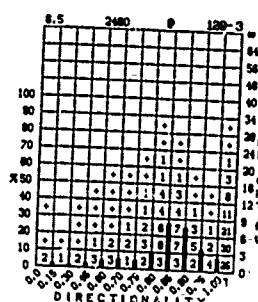
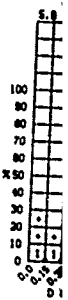
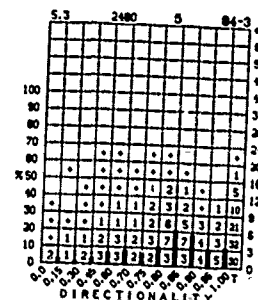
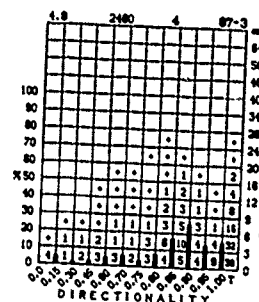
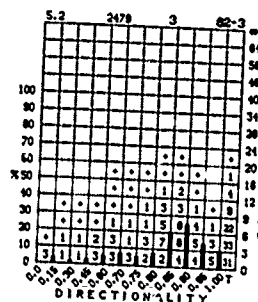
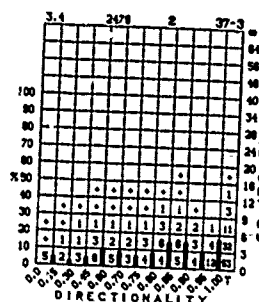
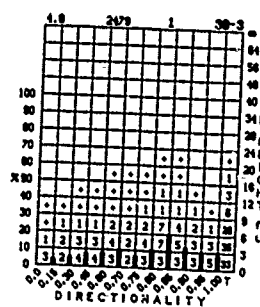


1 (2)

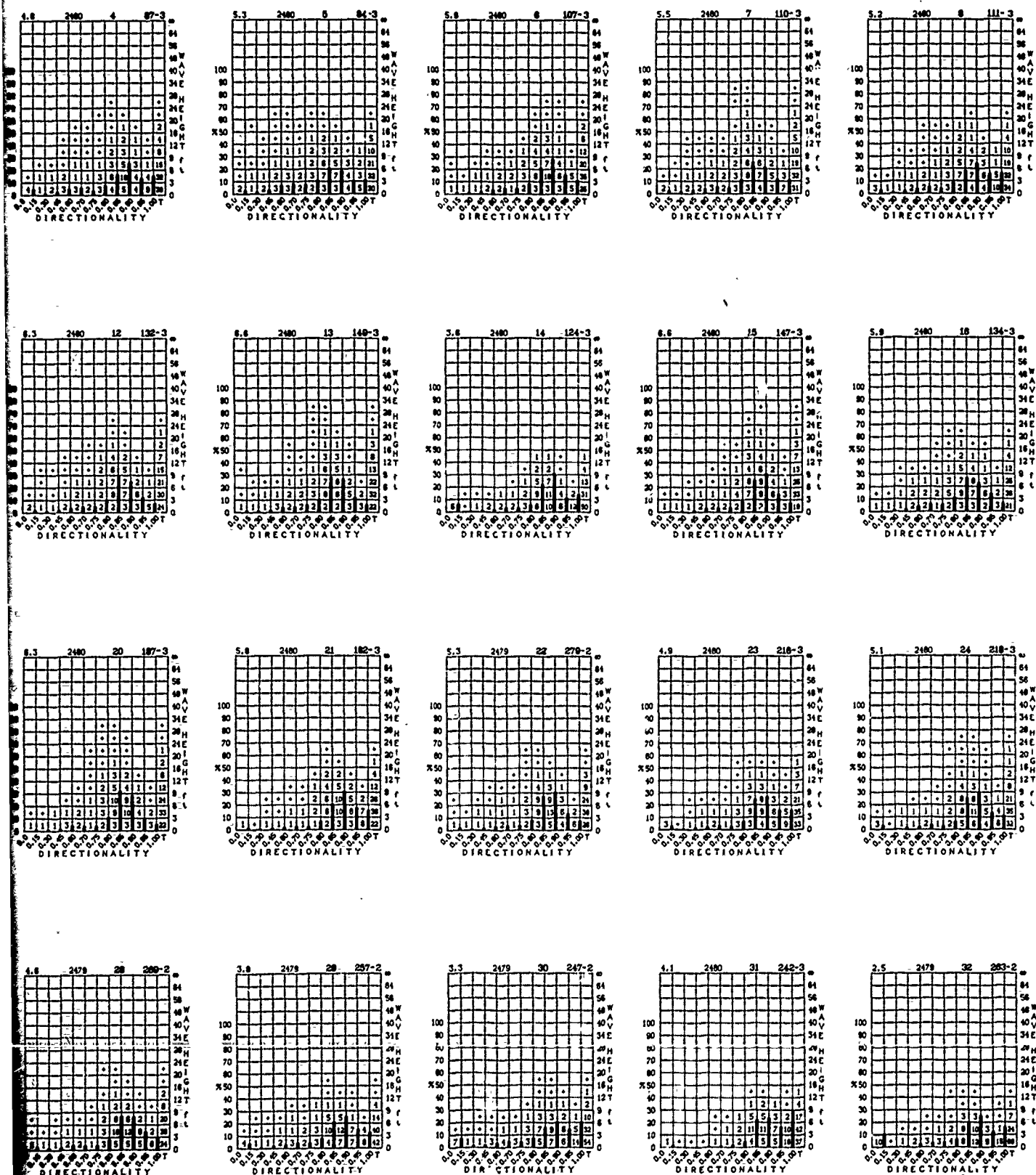


# AUGUST

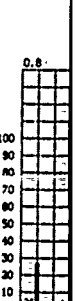
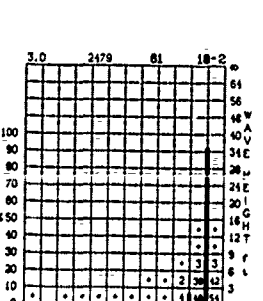
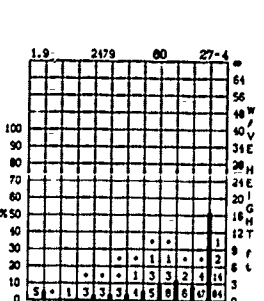
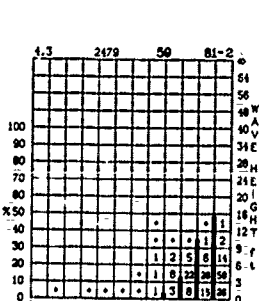
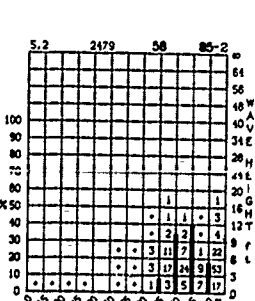
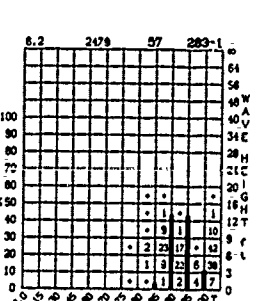
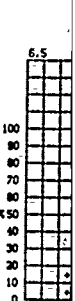
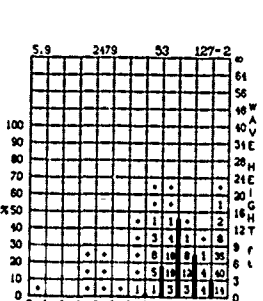
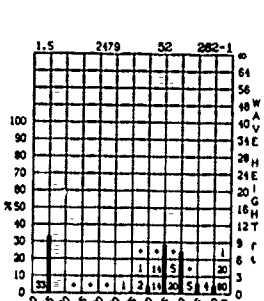
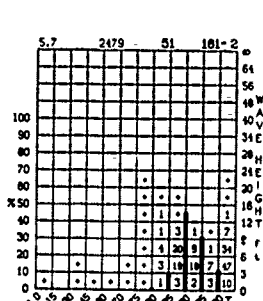
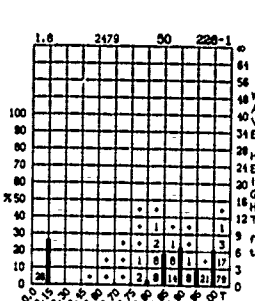
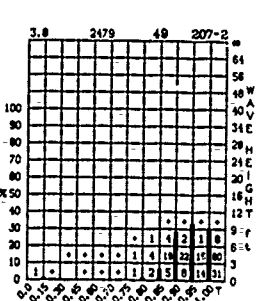
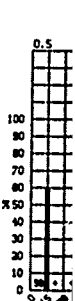
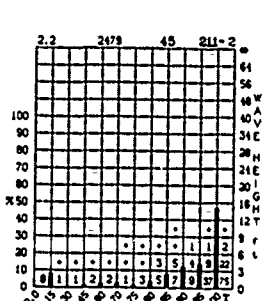
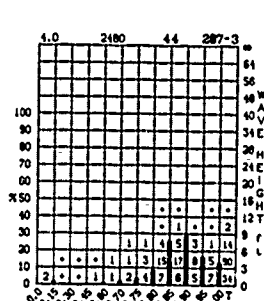
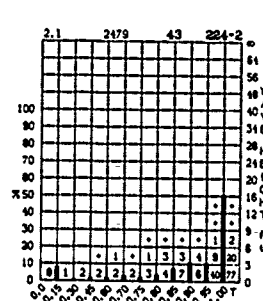
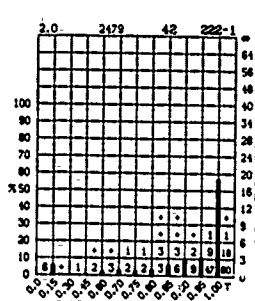
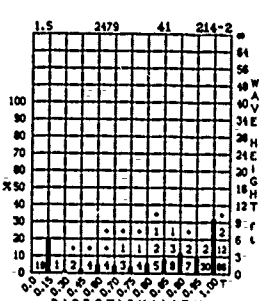
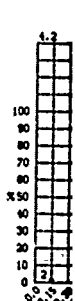
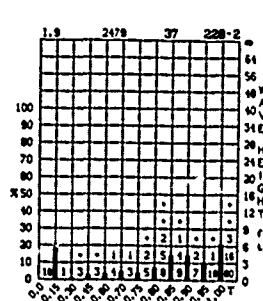
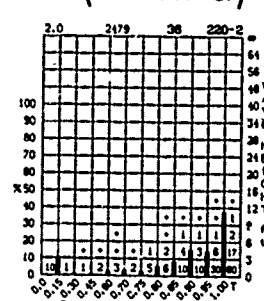
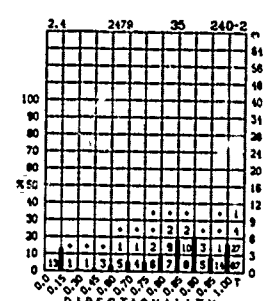
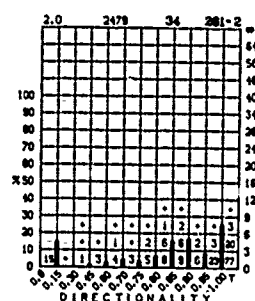
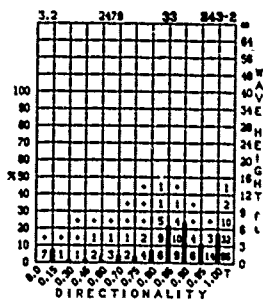
# WAVE



# WAVE HEIGHT AND DIRECTIONALITY

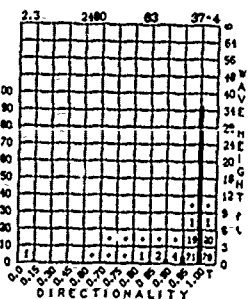
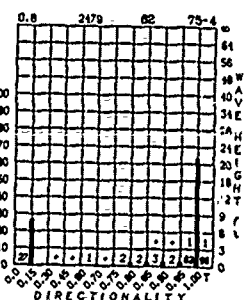
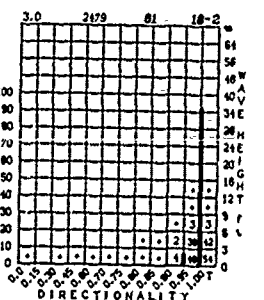
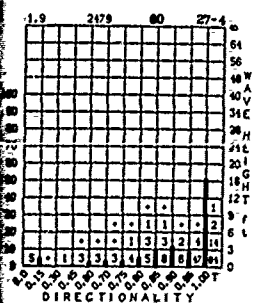
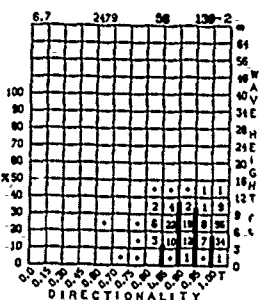
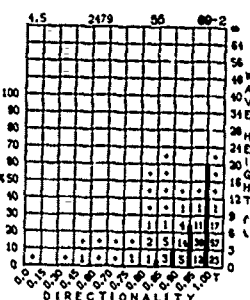
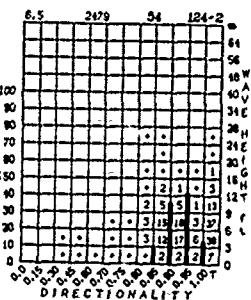
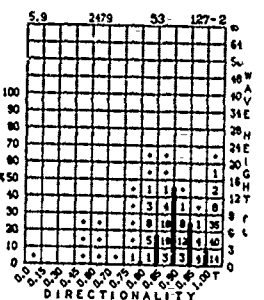
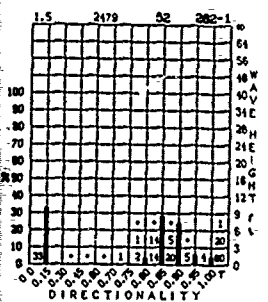
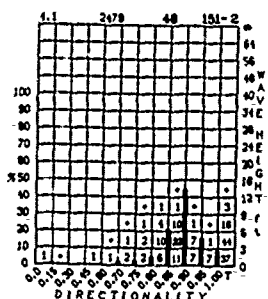
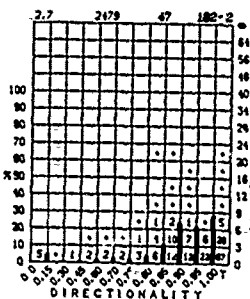
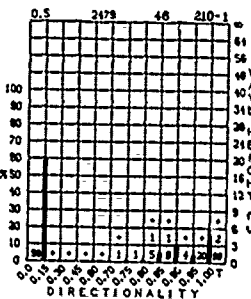
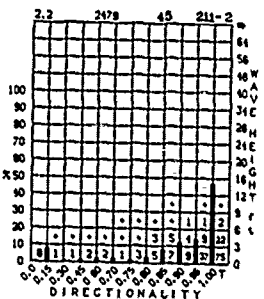
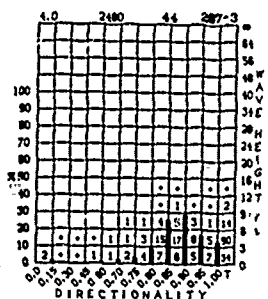
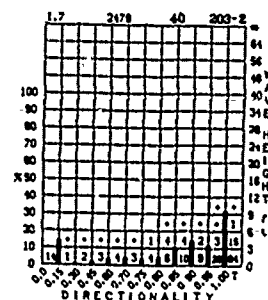
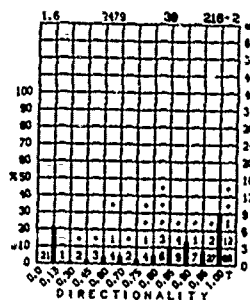
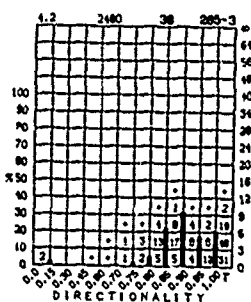
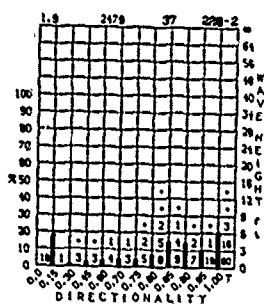
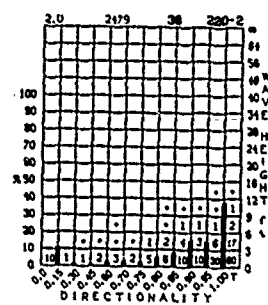


# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)



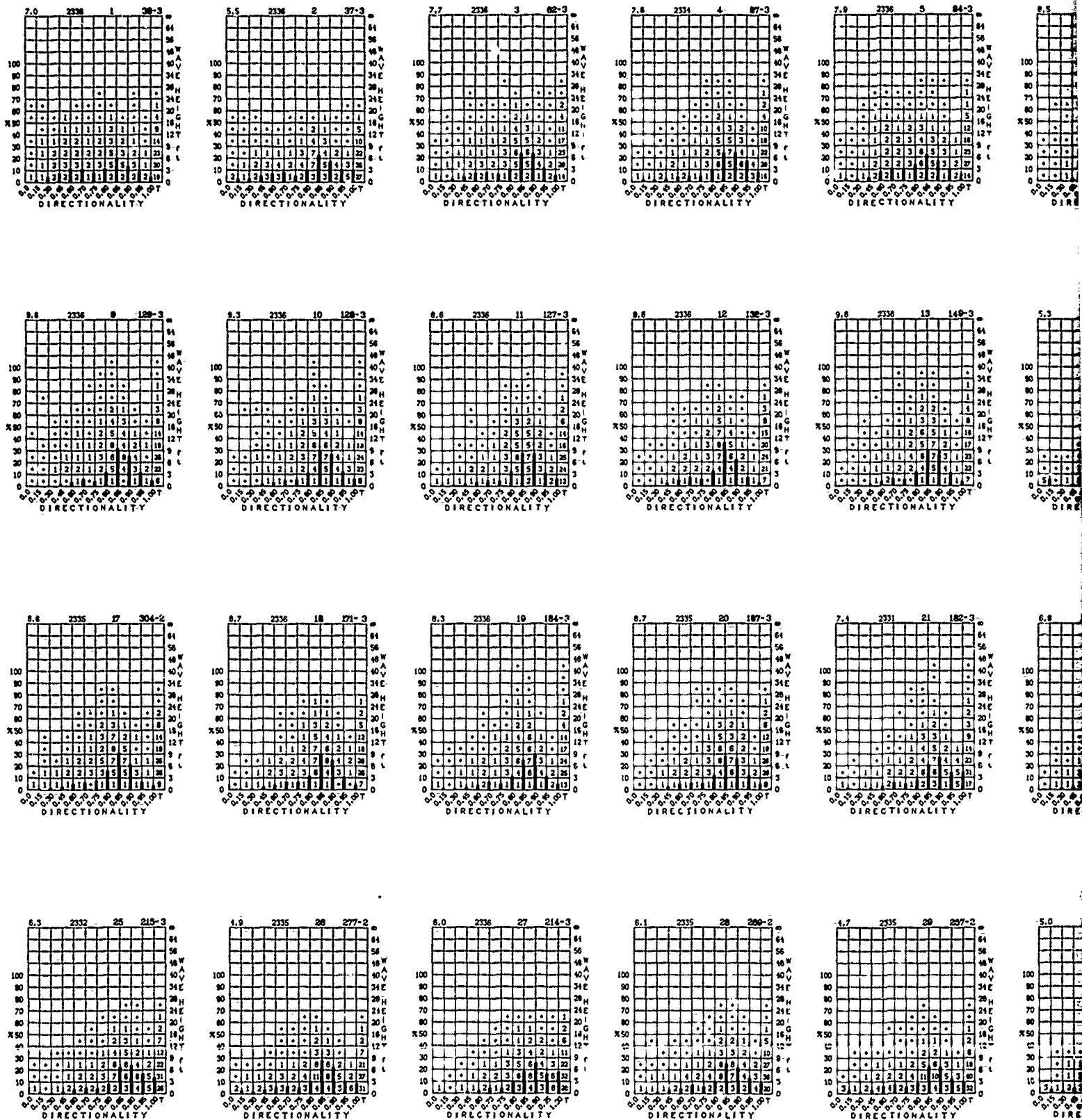
ITY (Cont'd)

AUGUST



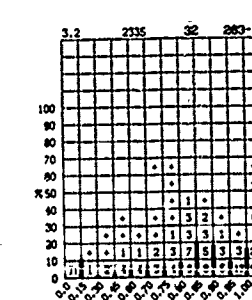
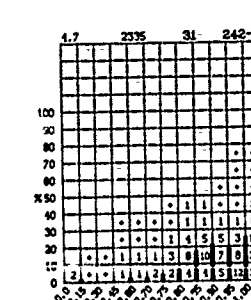
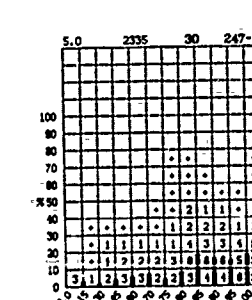
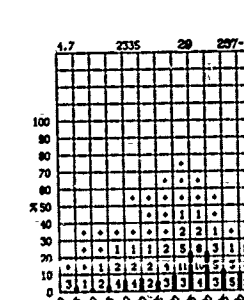
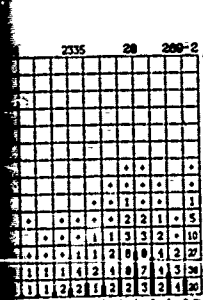
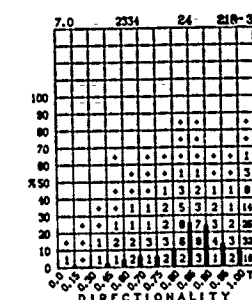
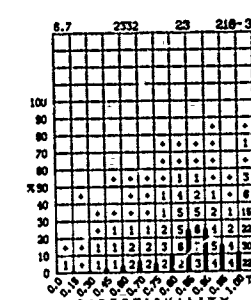
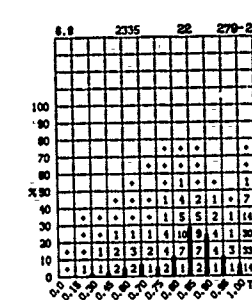
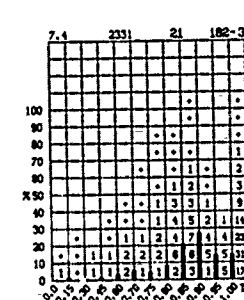
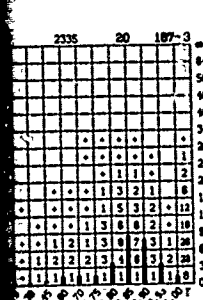
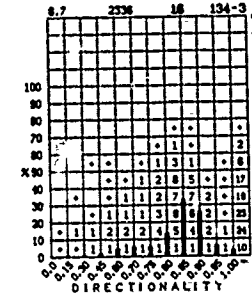
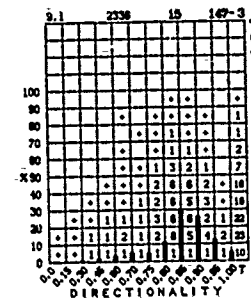
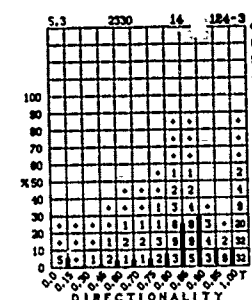
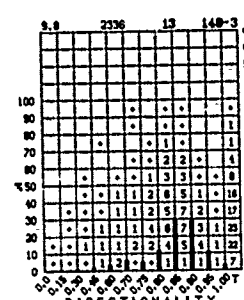
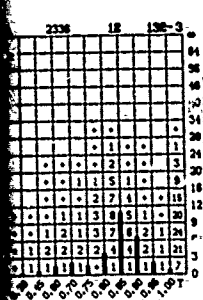
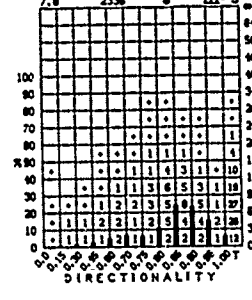
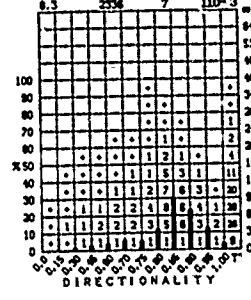
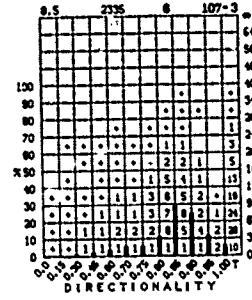
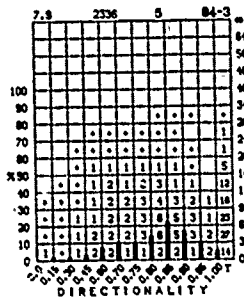
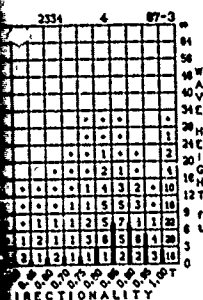
# SEPTEMBER

# WAVE



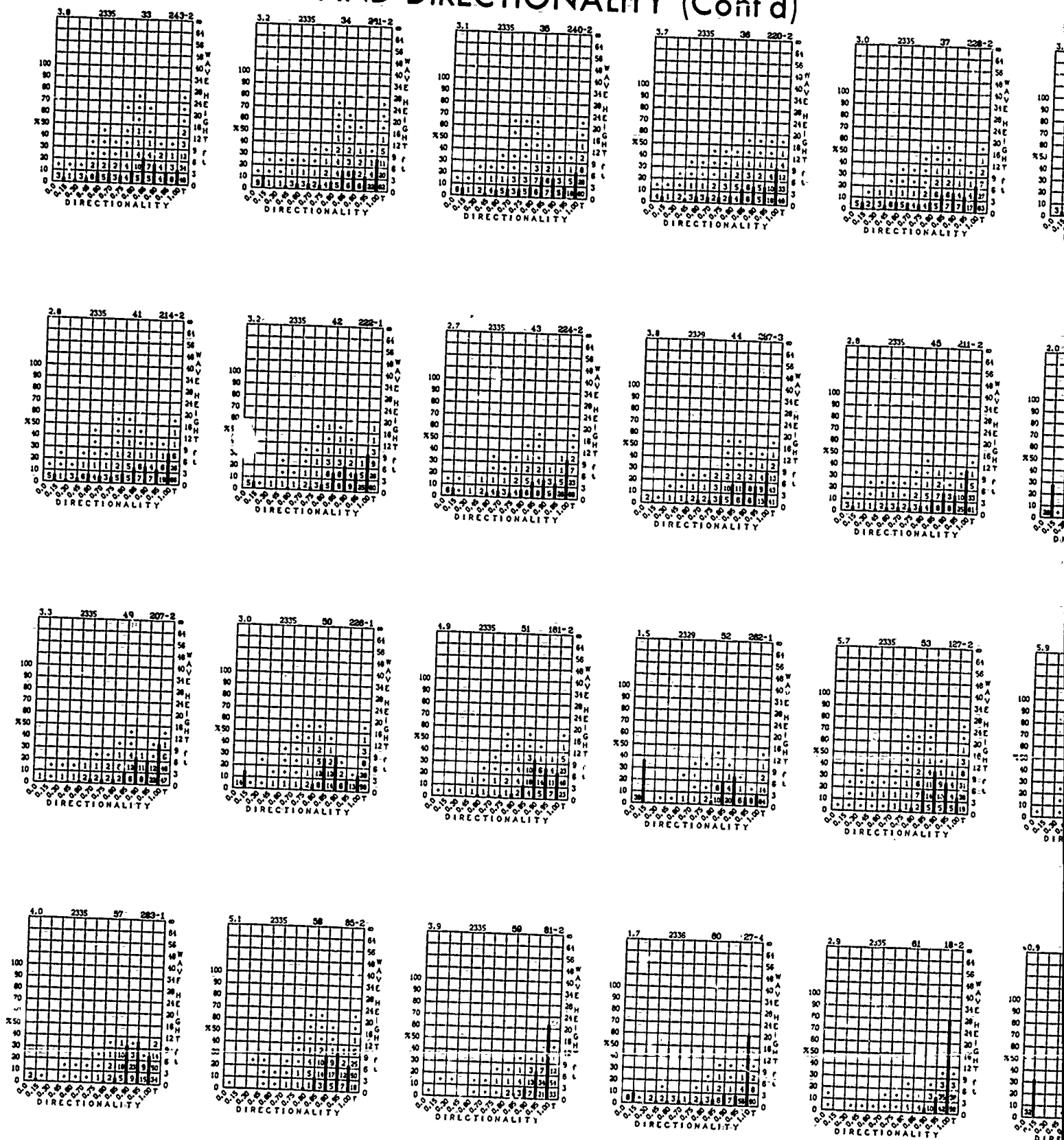
①

# WAVE HEIGHT AND DIRECTIONALITY





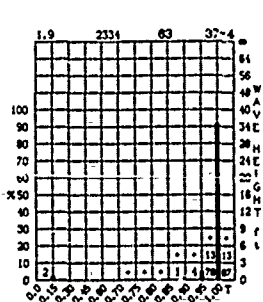
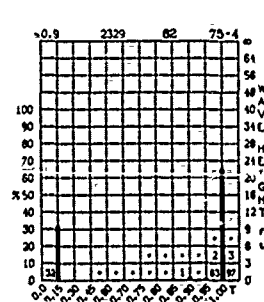
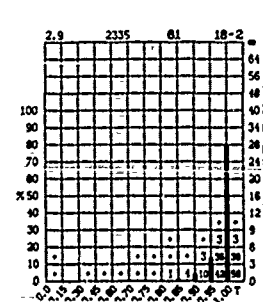
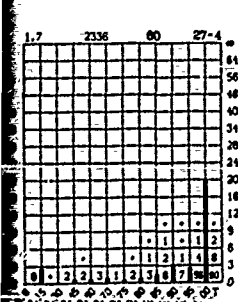
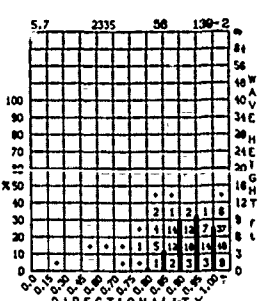
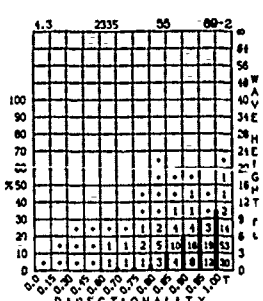
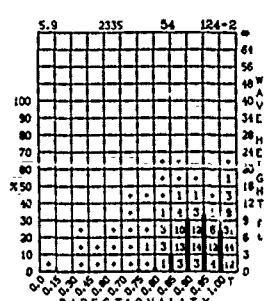
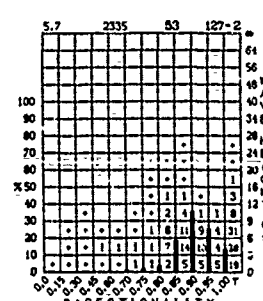
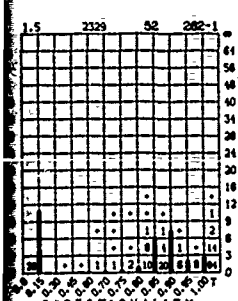
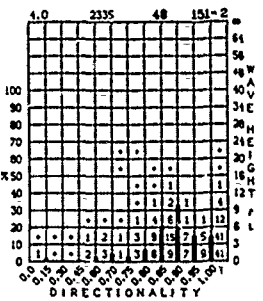
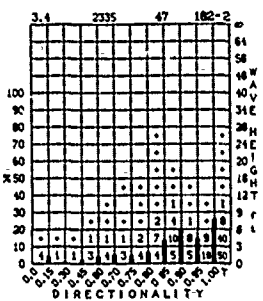
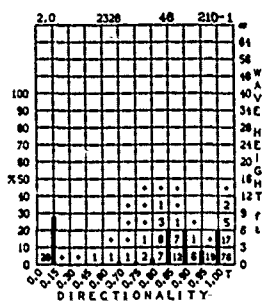
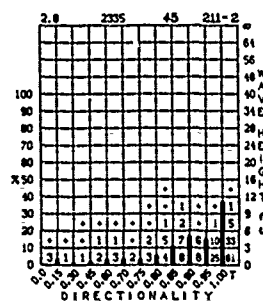
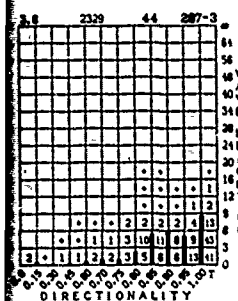
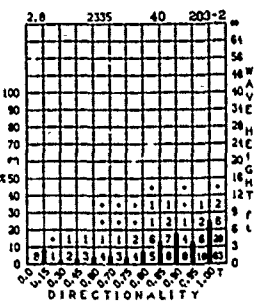
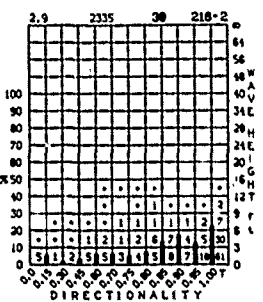
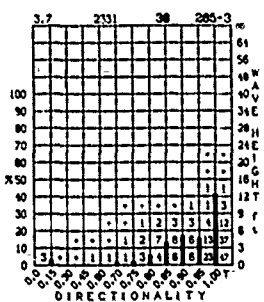
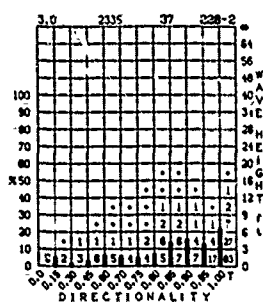
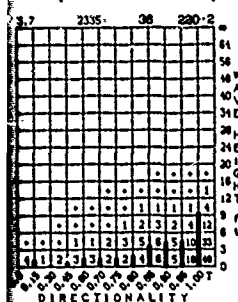
# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)





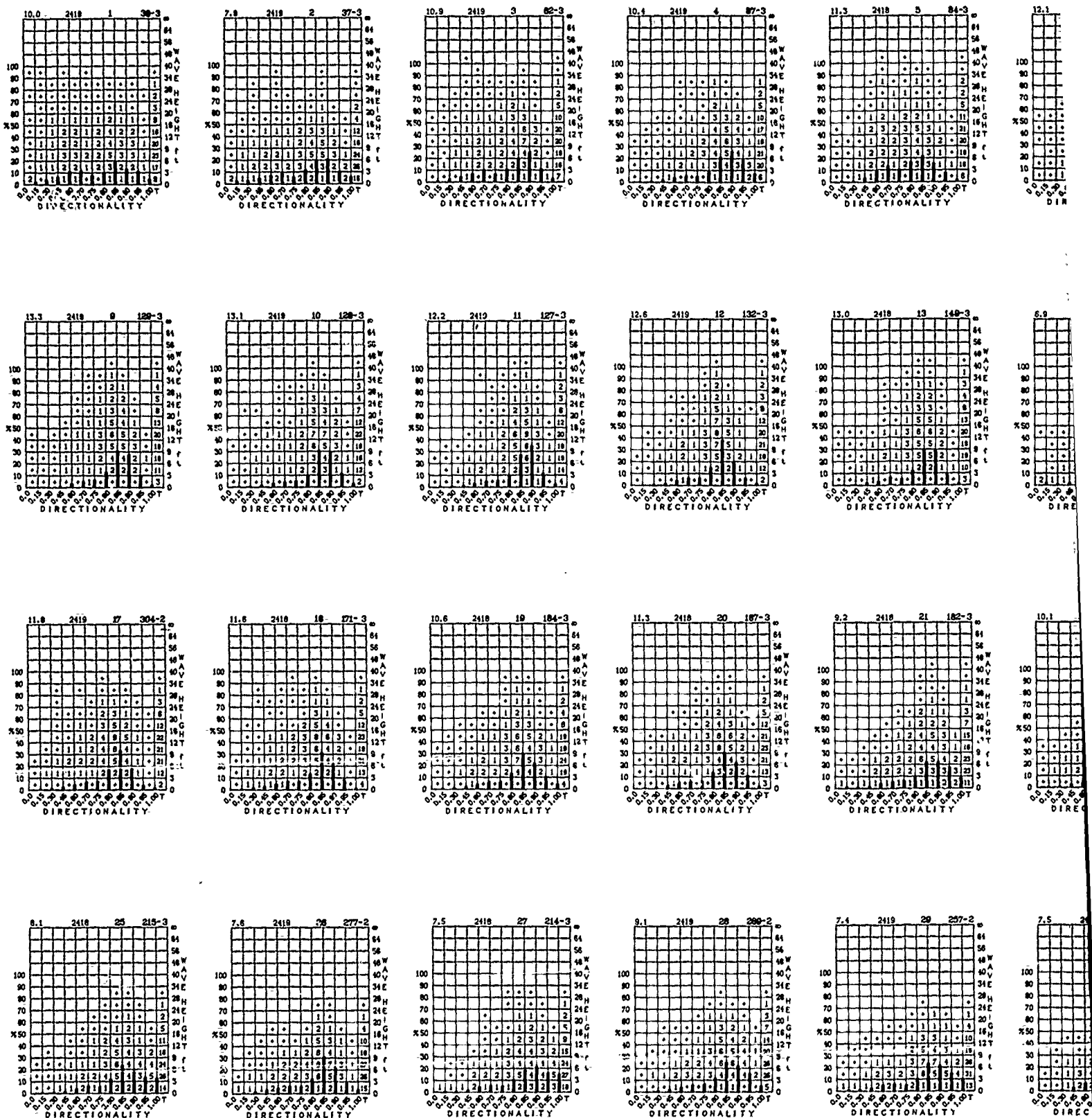
(Cont'd)

SEPTEMBER

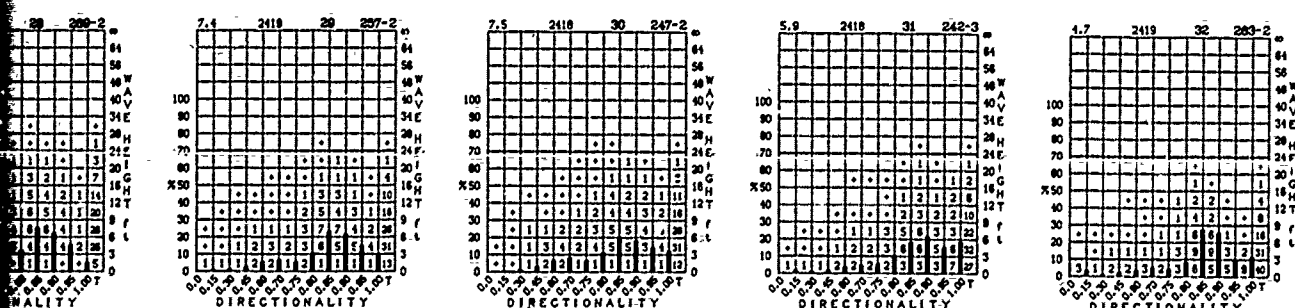
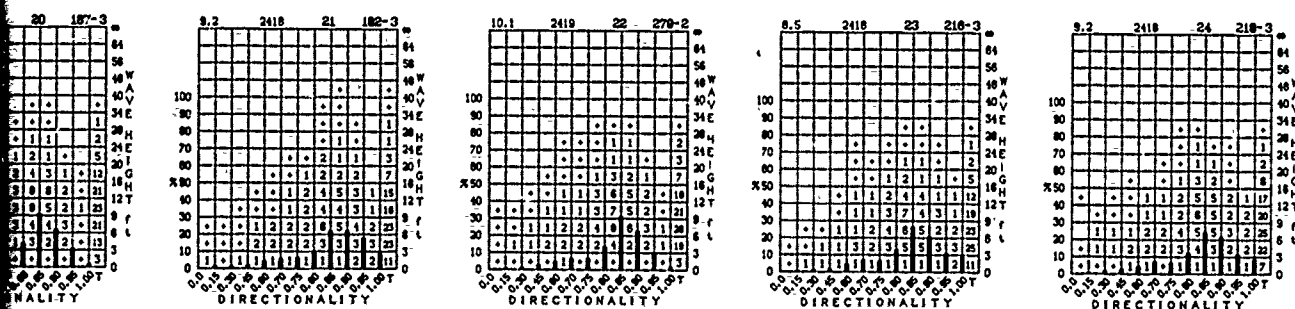
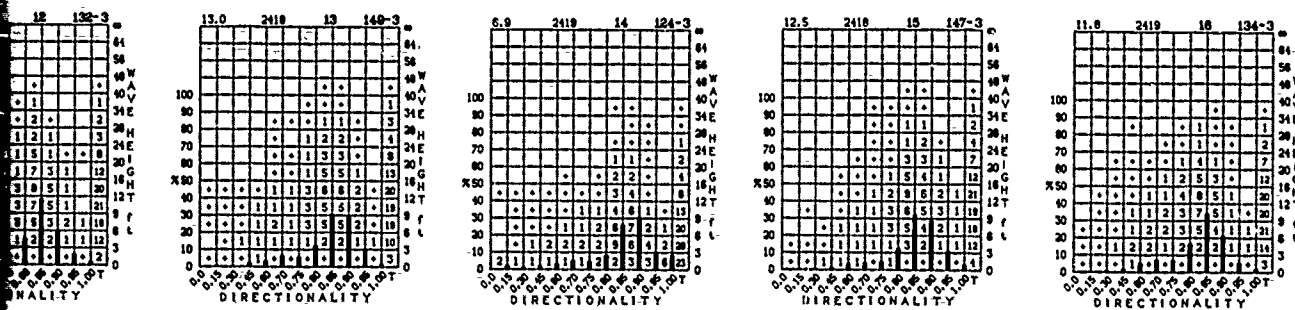
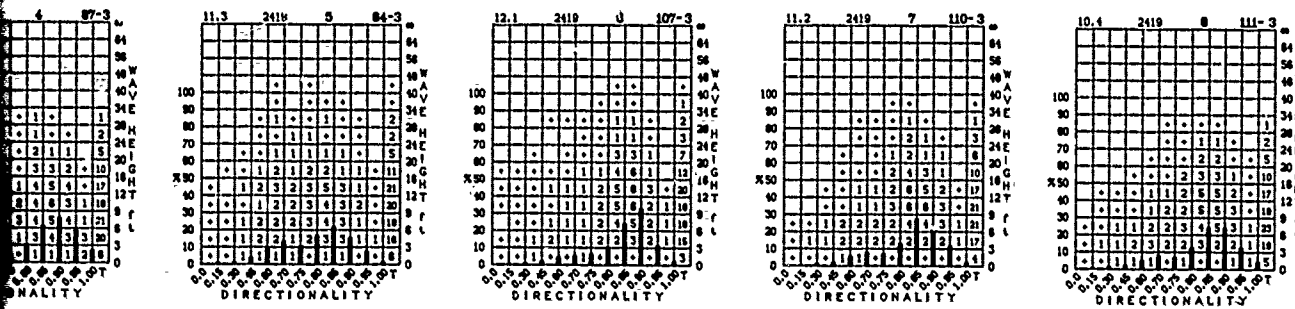


# OCTOBER

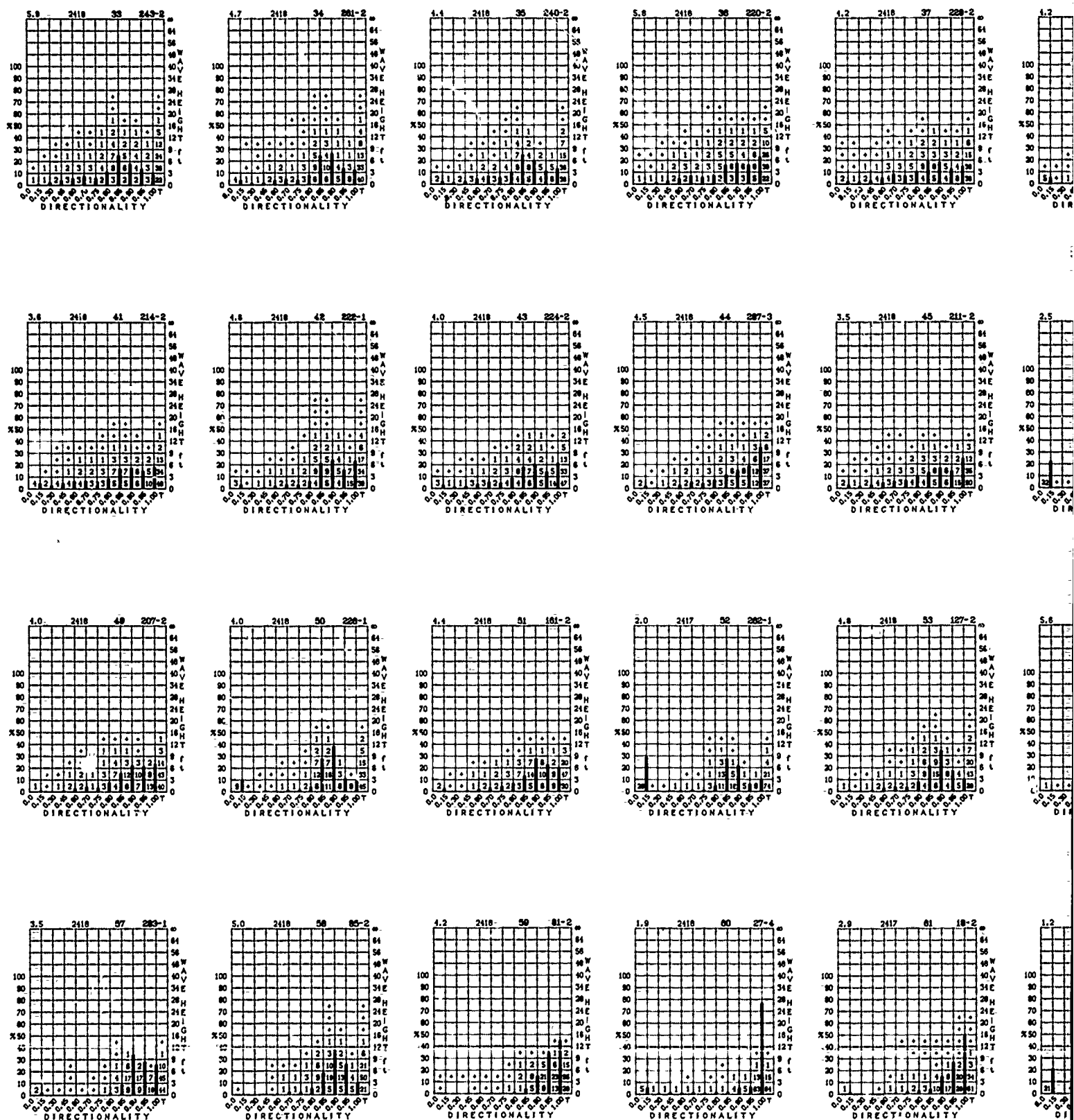
# WAVE

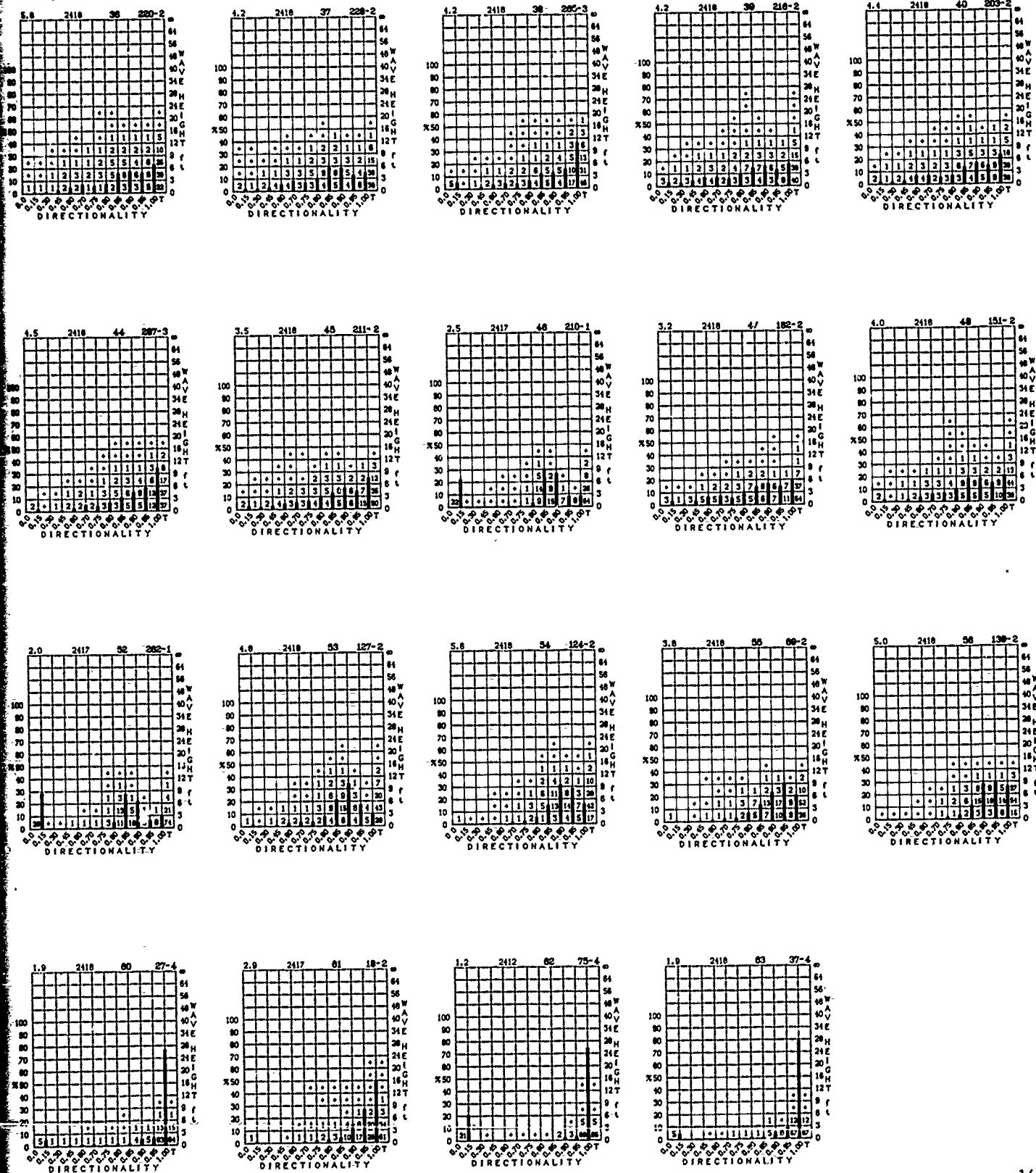


# WAVE HEIGHT AND DIRECTIONALITY



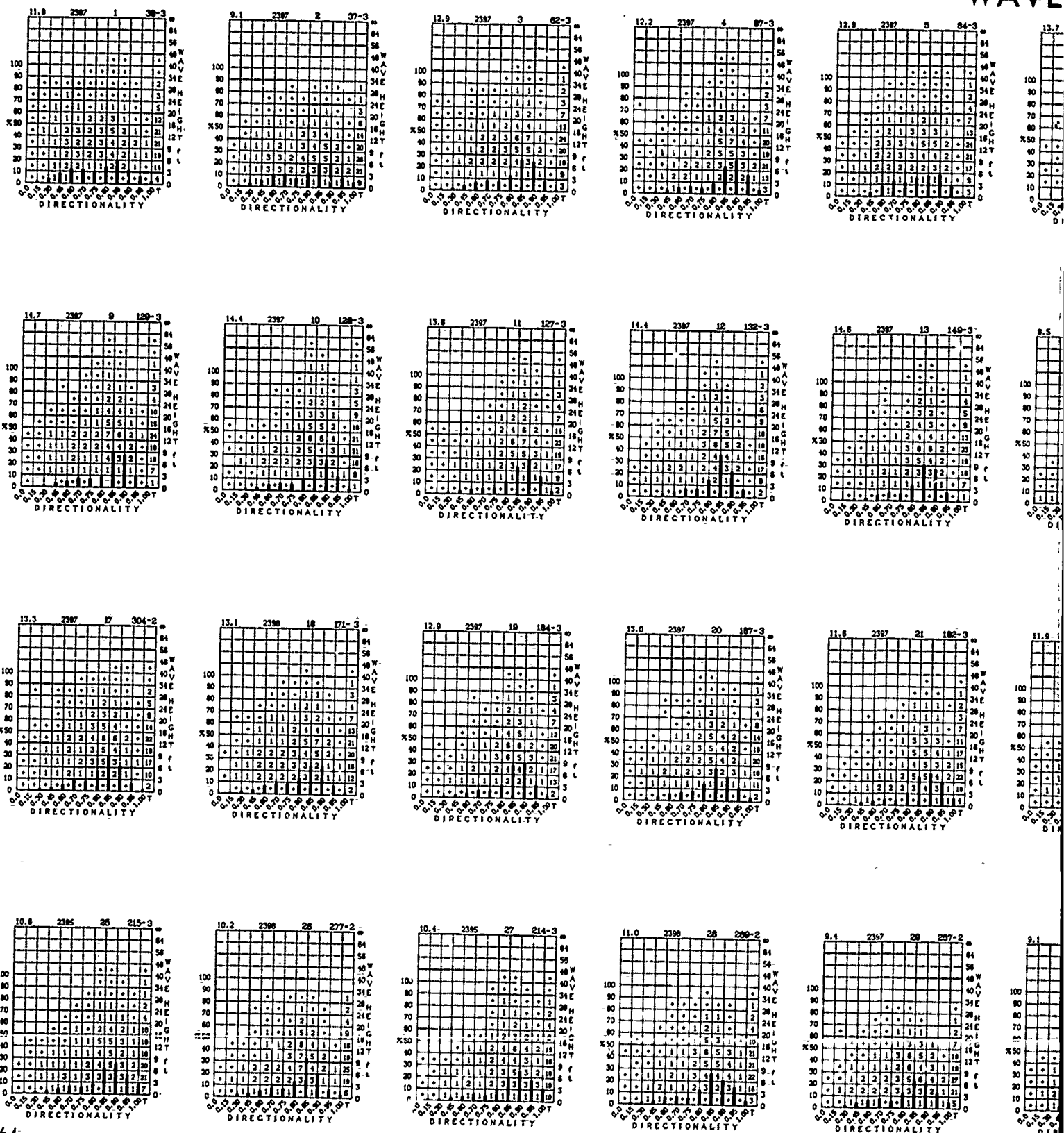
# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)





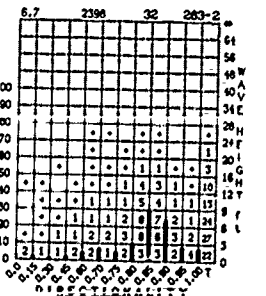
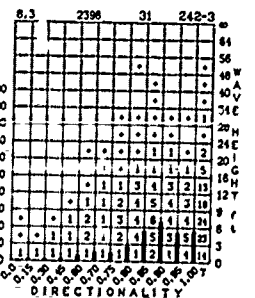
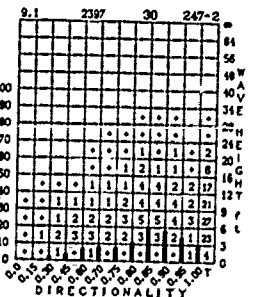
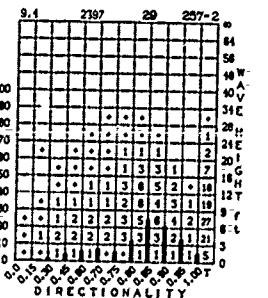
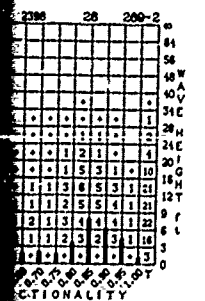
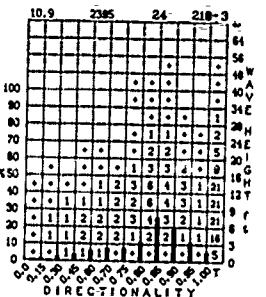
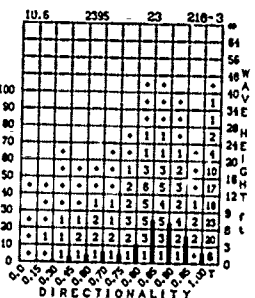
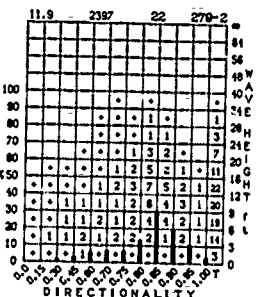
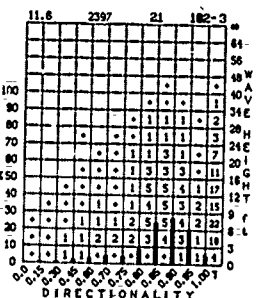
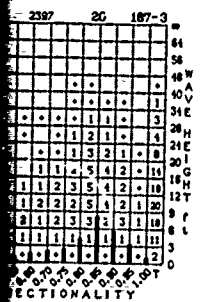
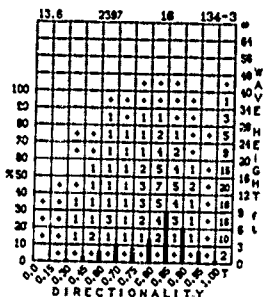
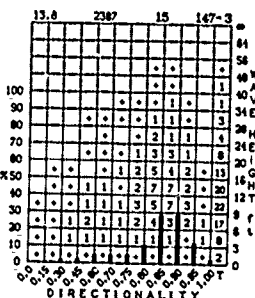
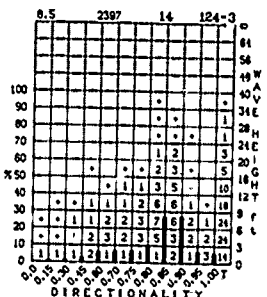
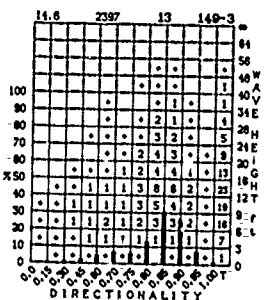
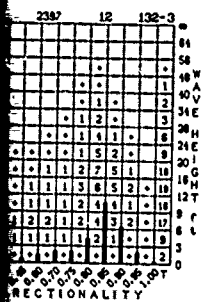
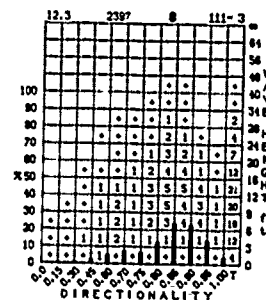
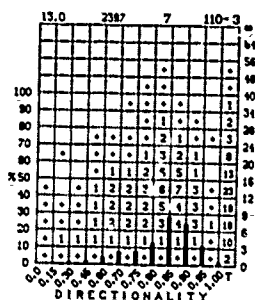
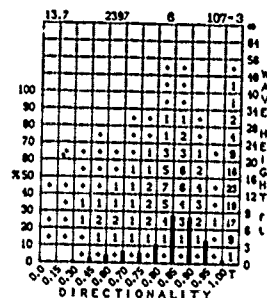
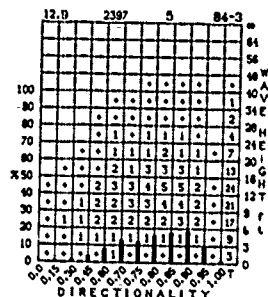
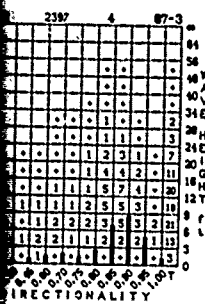
# NOVEMBER

# WAVE



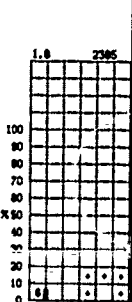
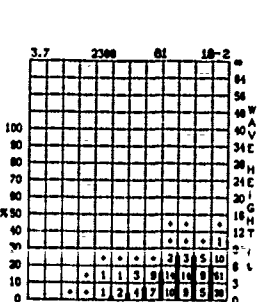
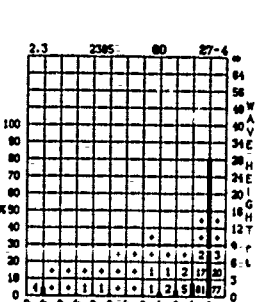
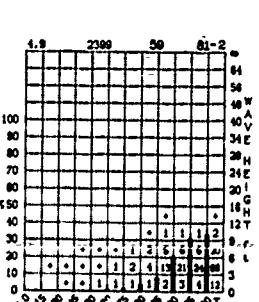
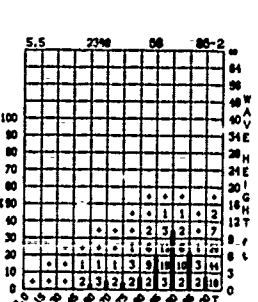
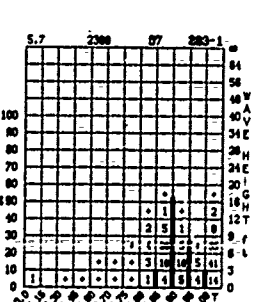
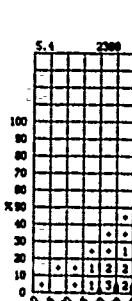
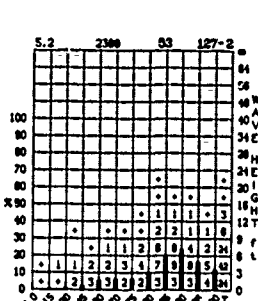
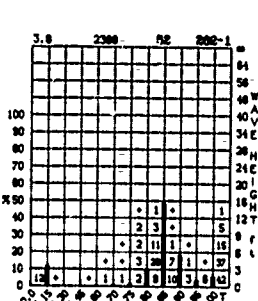
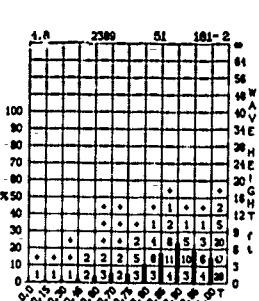
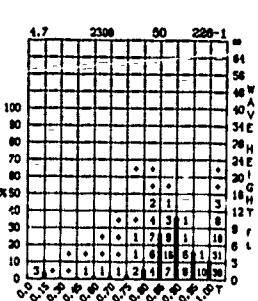
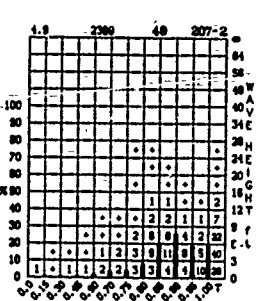
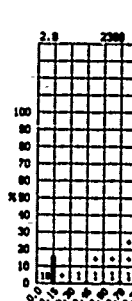
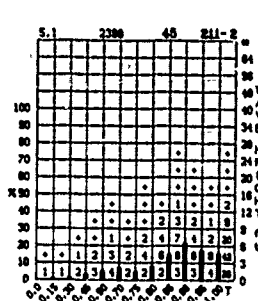
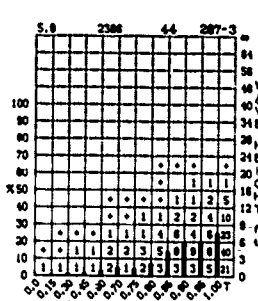
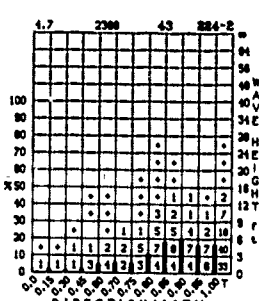
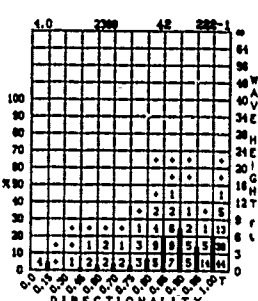
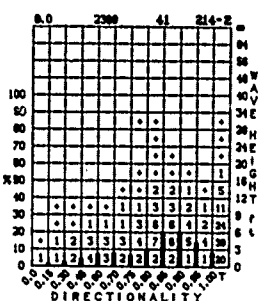
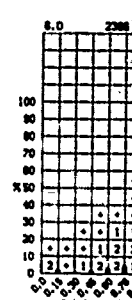
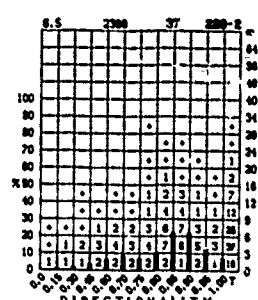
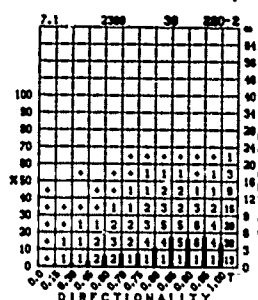
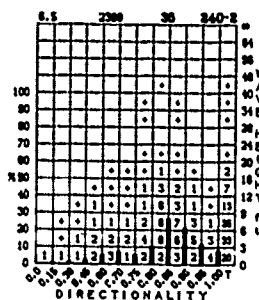
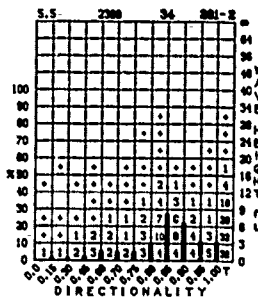
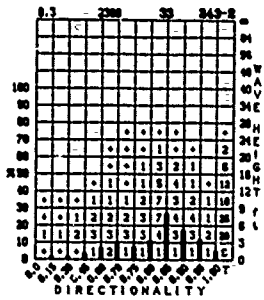


# WAVE HEIGHT AND DIRECTIONALITY



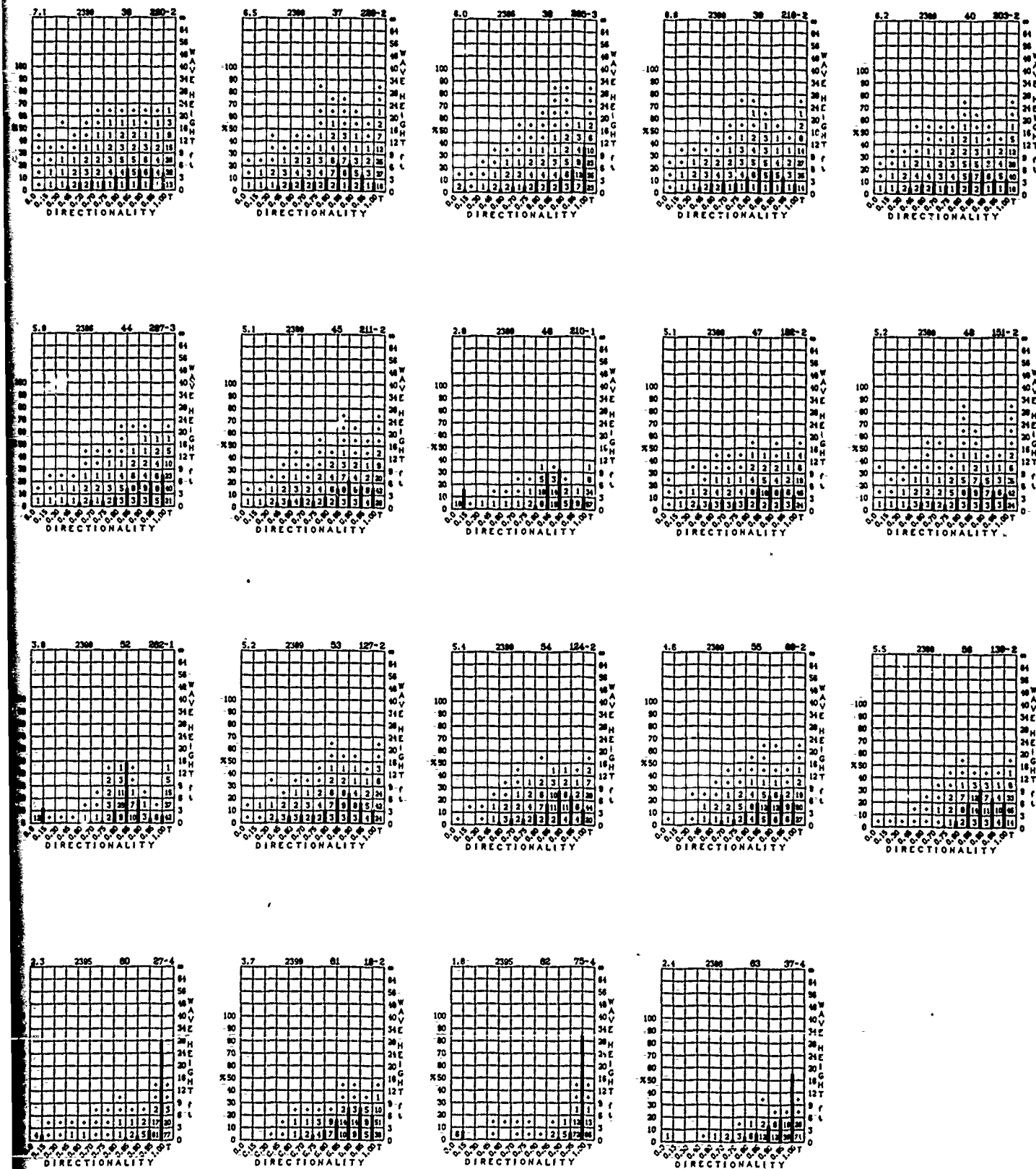


# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)



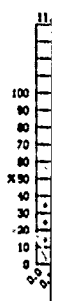
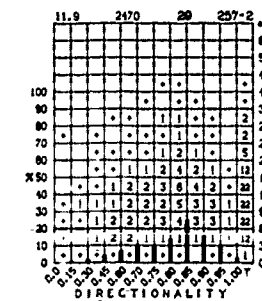
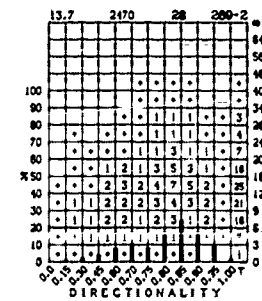
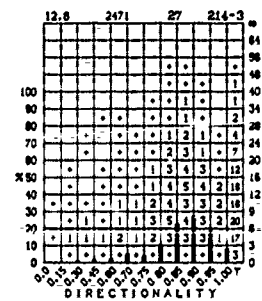
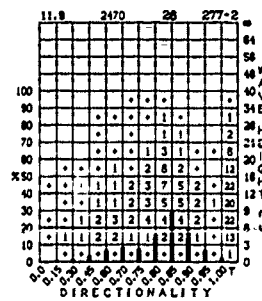
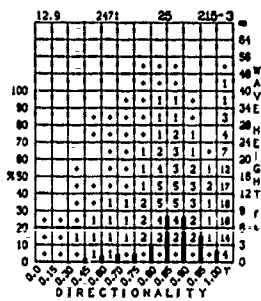
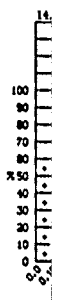
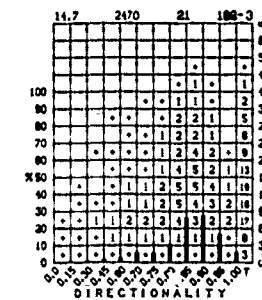
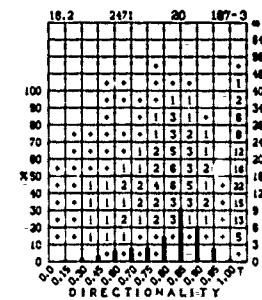
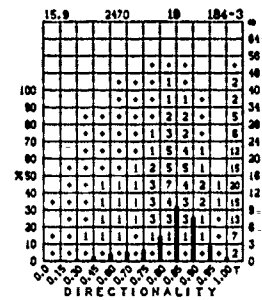
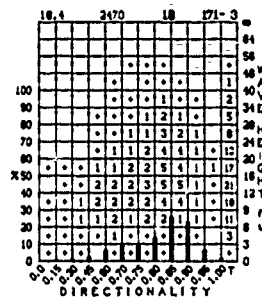
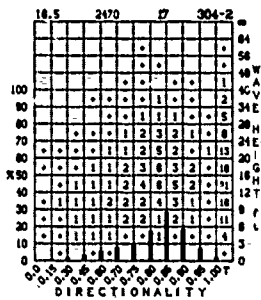
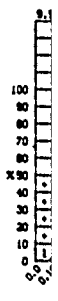
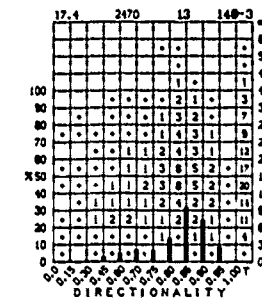
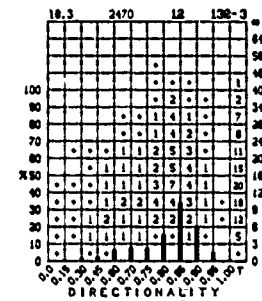
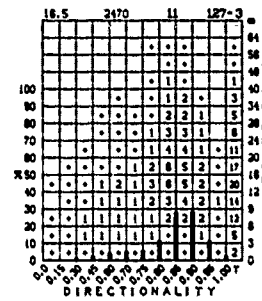
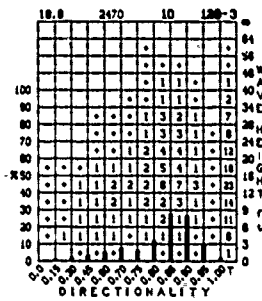
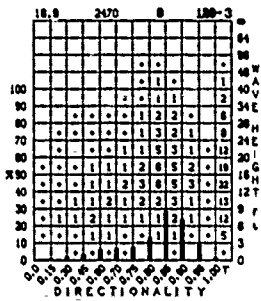
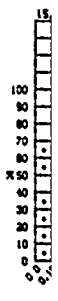
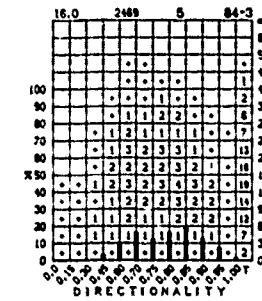
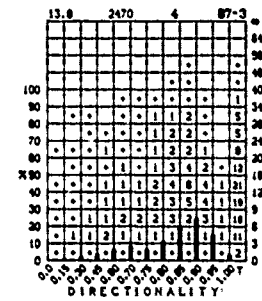
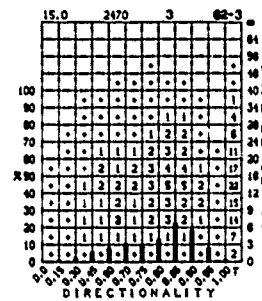
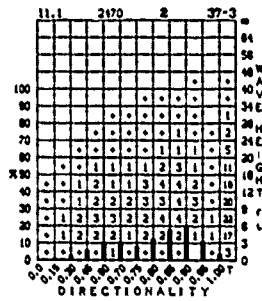
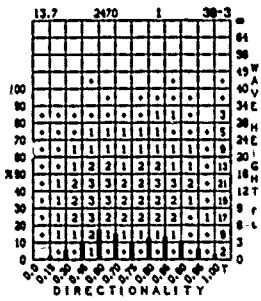
TY (Cont'd)

NOVEMBER

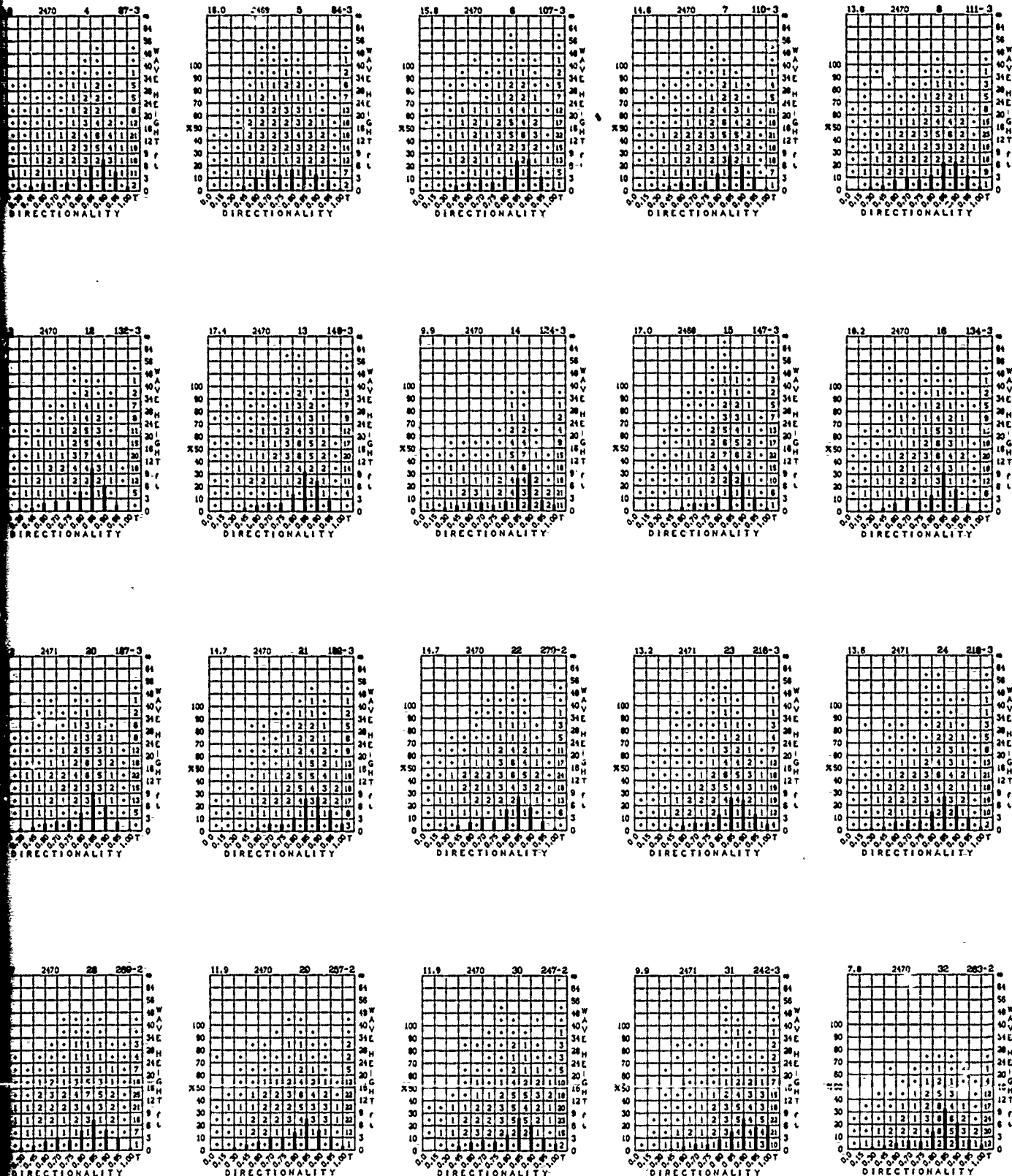


# DECEMBER

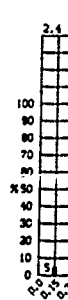
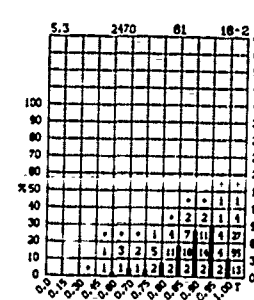
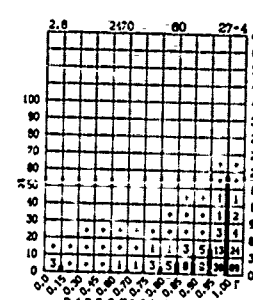
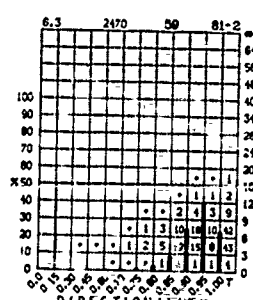
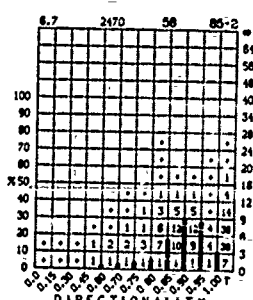
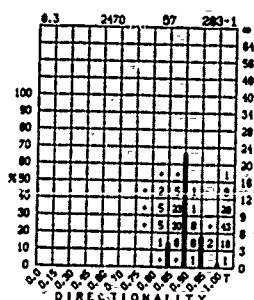
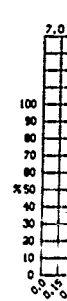
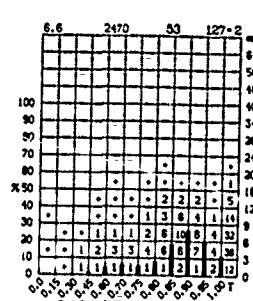
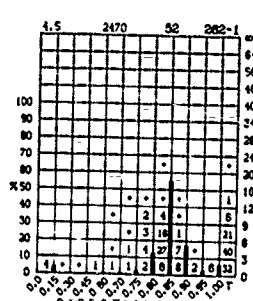
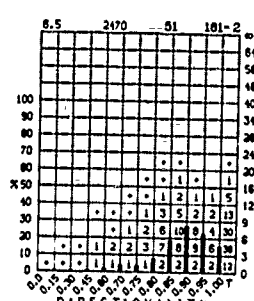
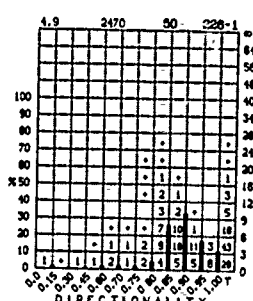
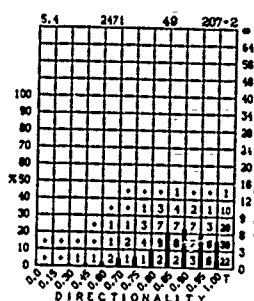
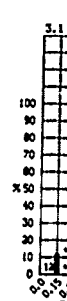
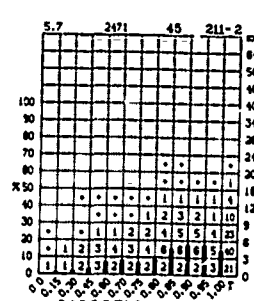
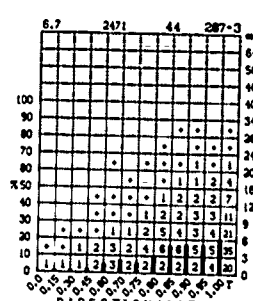
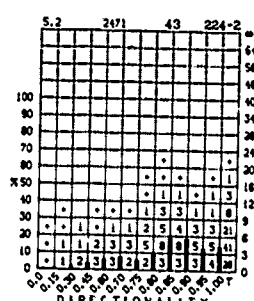
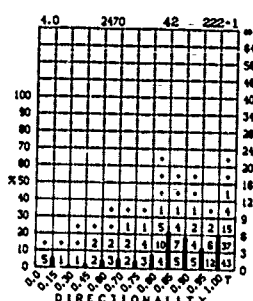
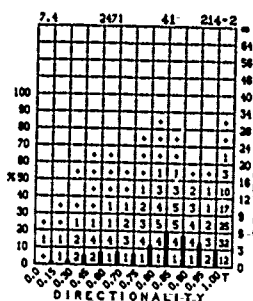
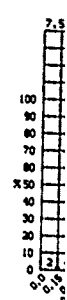
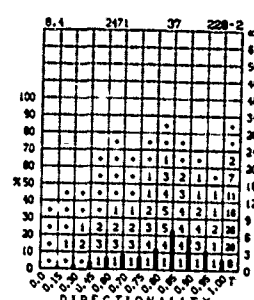
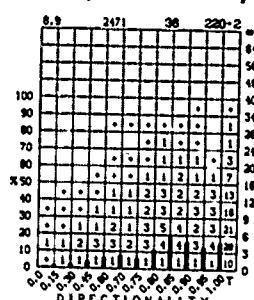
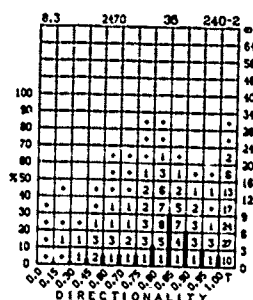
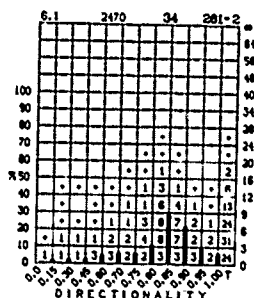
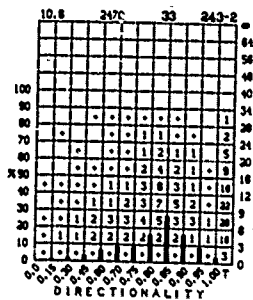
# WAVE



# WAVE HEIGHT AND DIRECTIONALITY

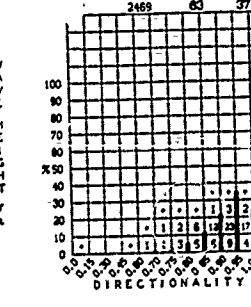
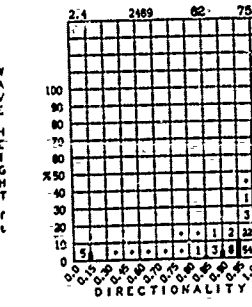
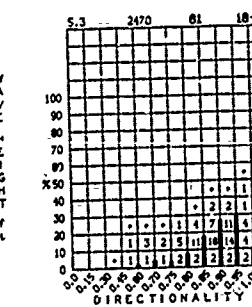
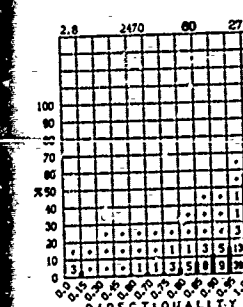
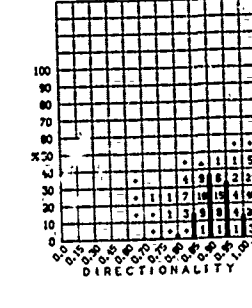
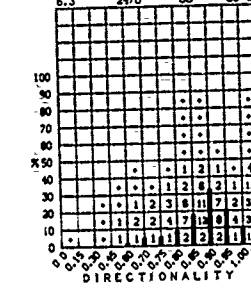
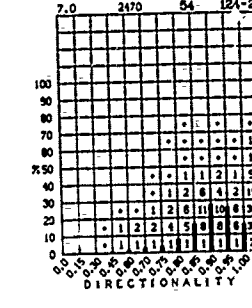
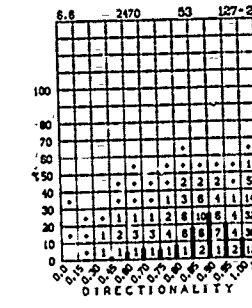
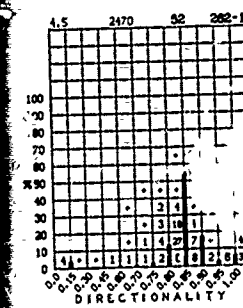
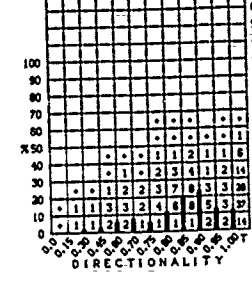
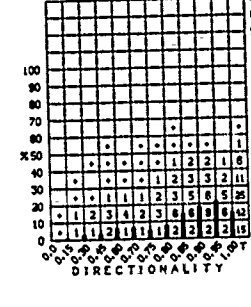
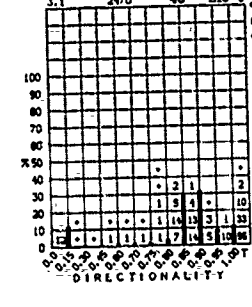
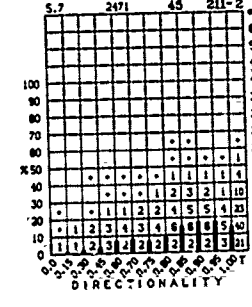
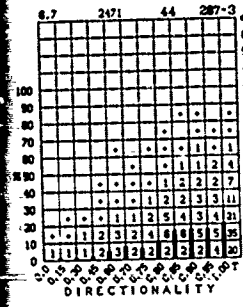
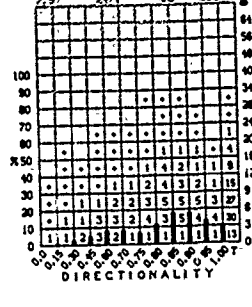
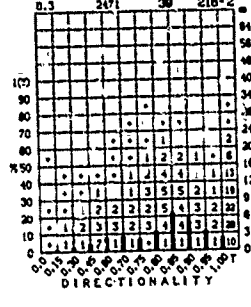
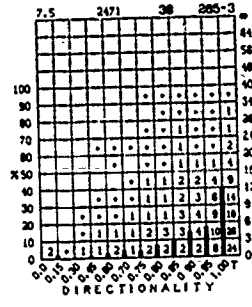
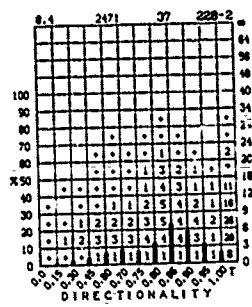
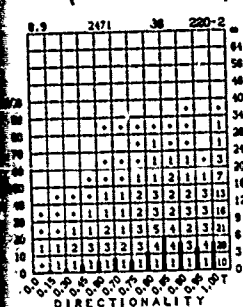


# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)



Y (Cont'd)

DECEMBER

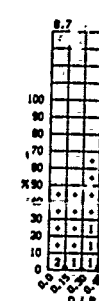
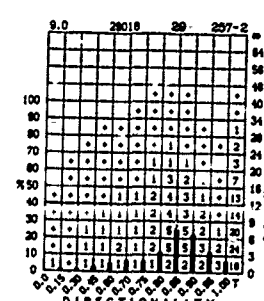
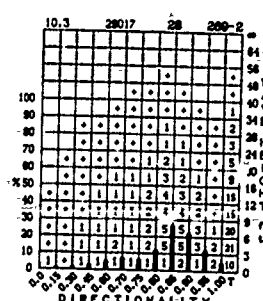
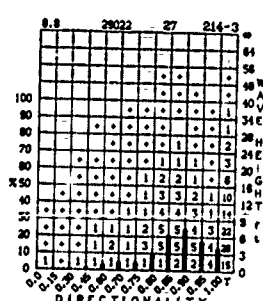
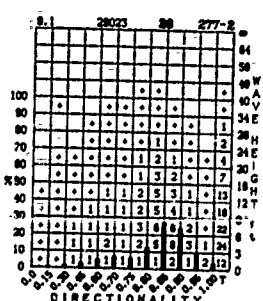
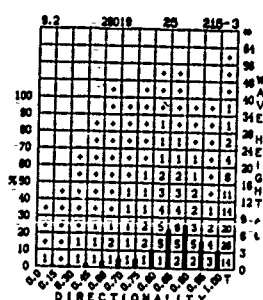
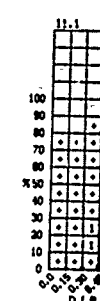
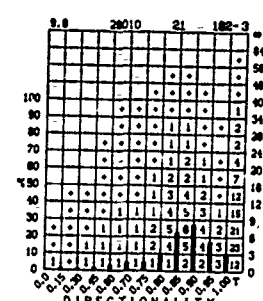
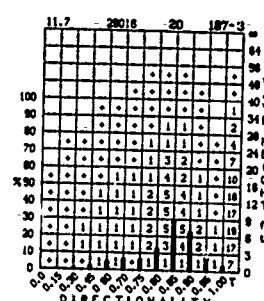
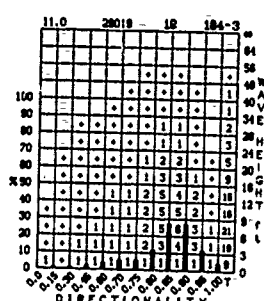
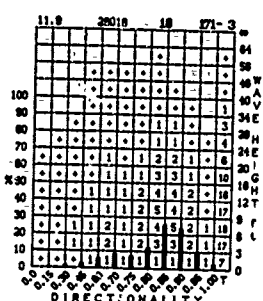
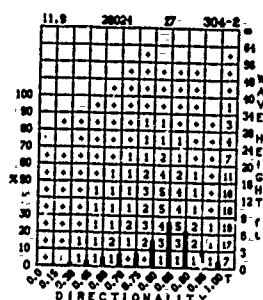
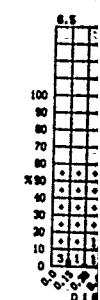
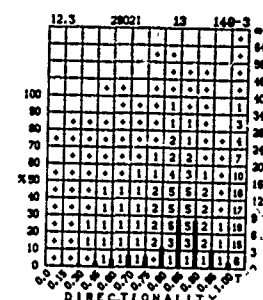
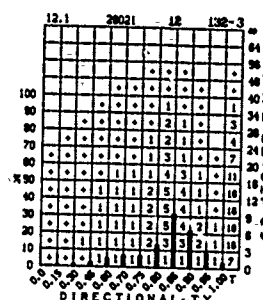
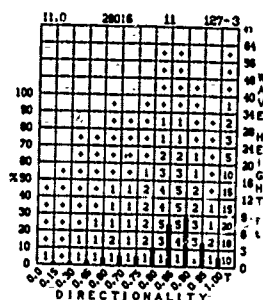
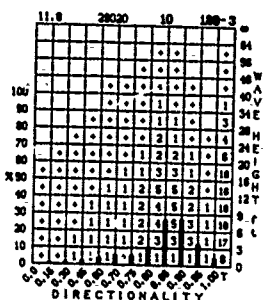
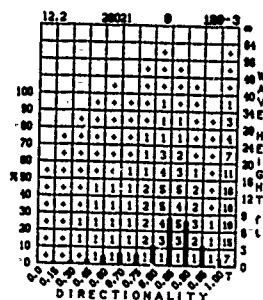
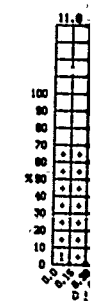
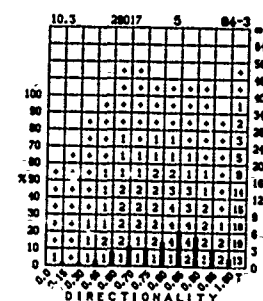
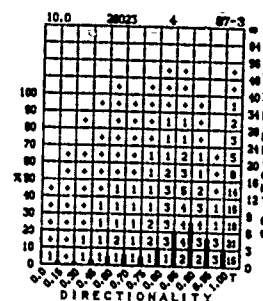
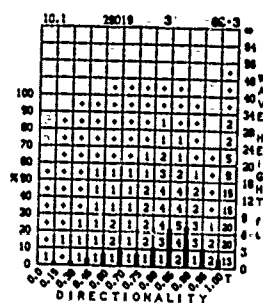
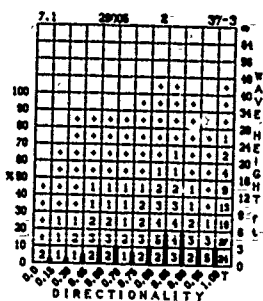
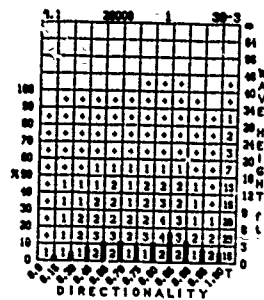


2



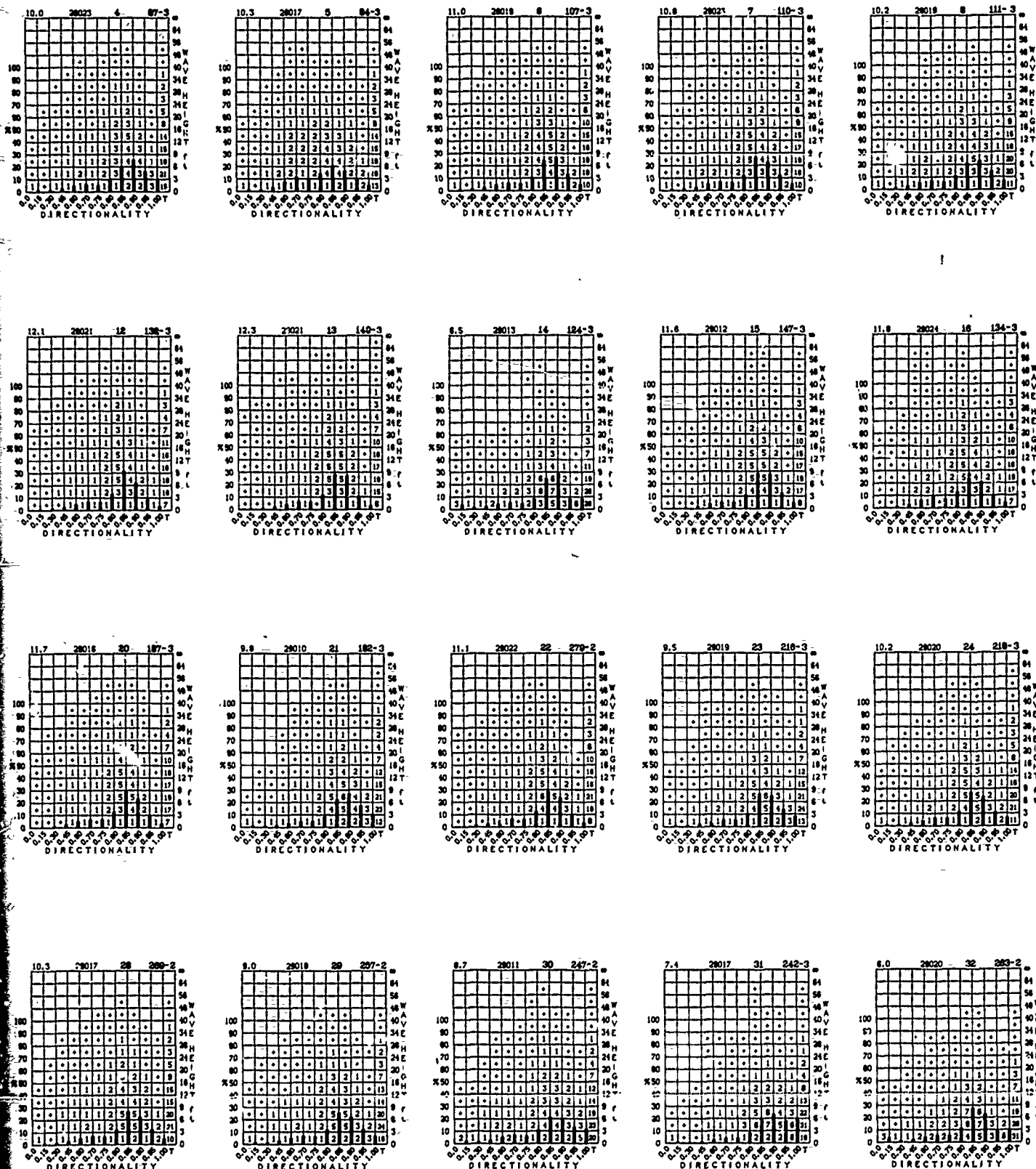
# ANNUAL

# WAVE

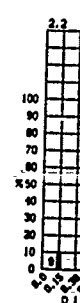
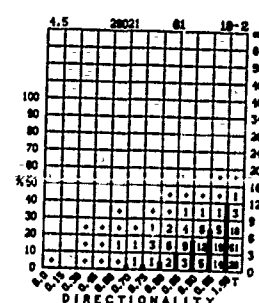
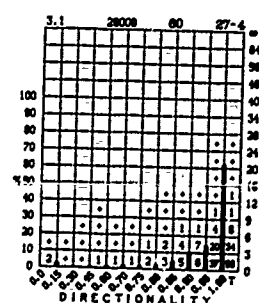
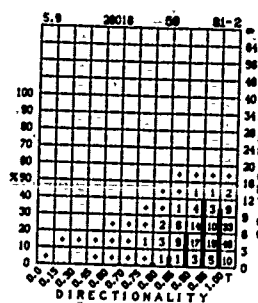
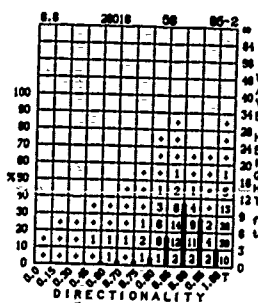
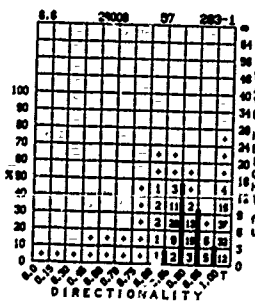
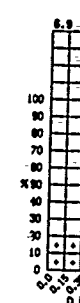
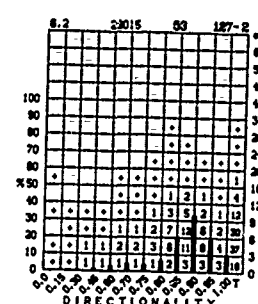
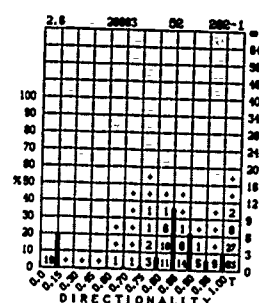
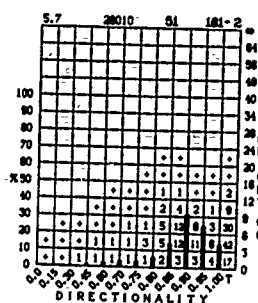
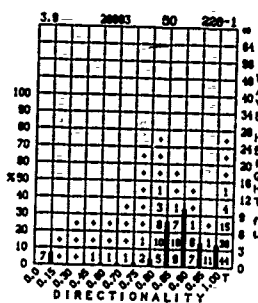
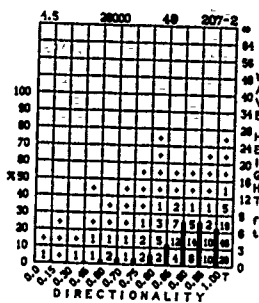
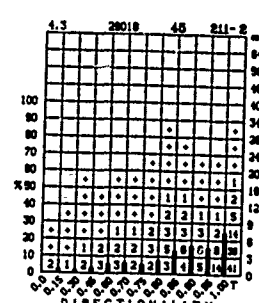
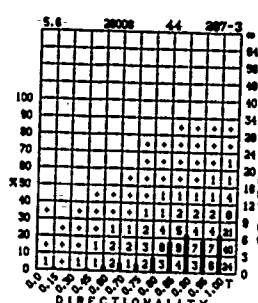
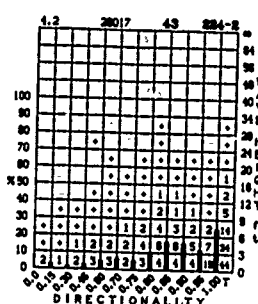
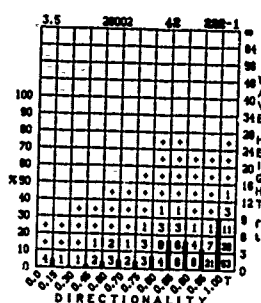
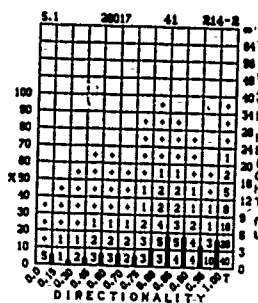
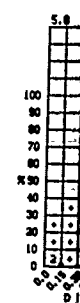
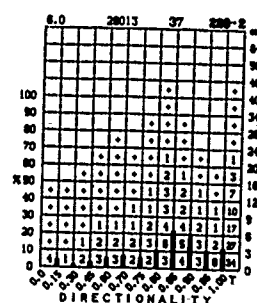
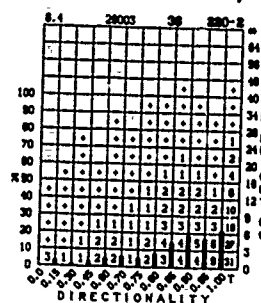
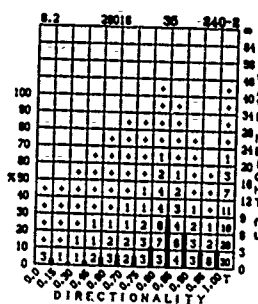
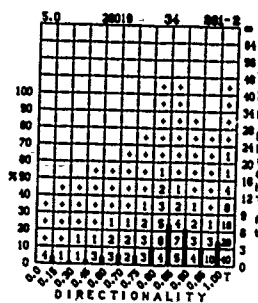
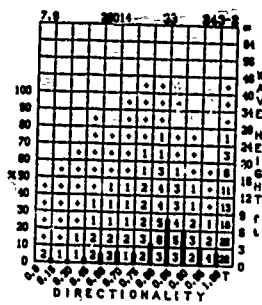




# WAVE HEIGHT AND DIRECTIONALITY

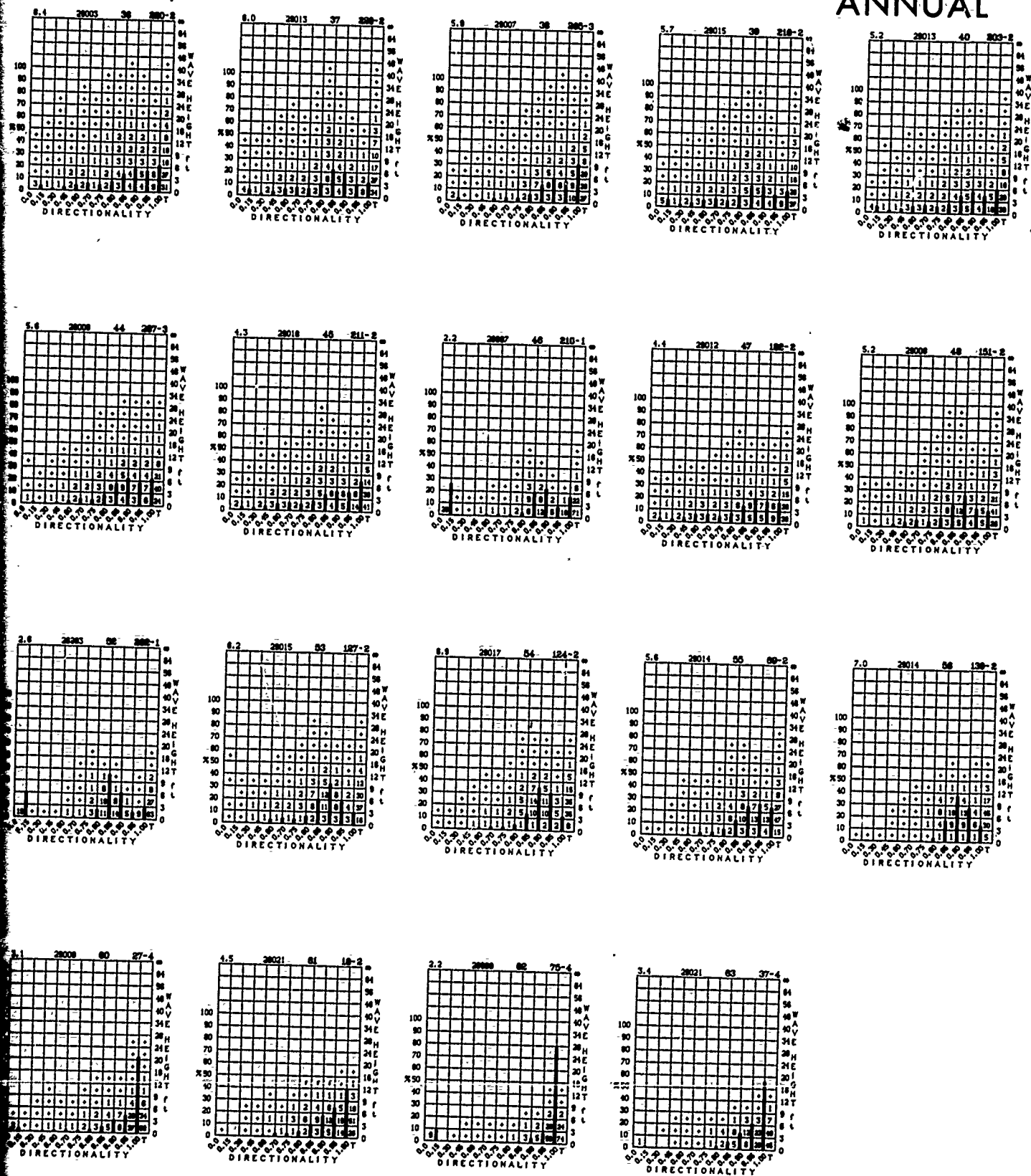


# WAVE HEIGHT AND DIRECTIONALITY (Cont'd)



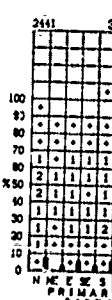
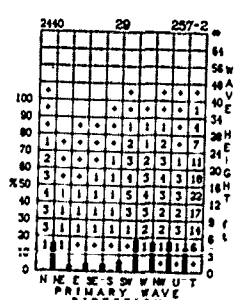
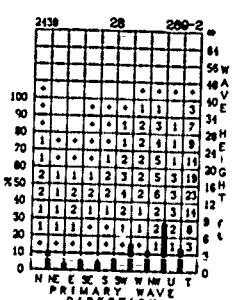
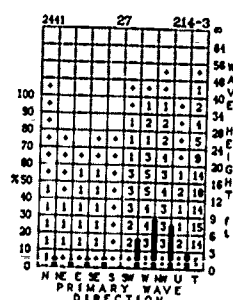
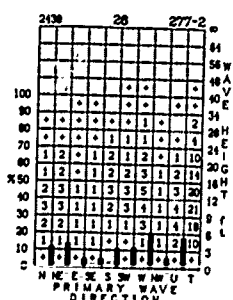
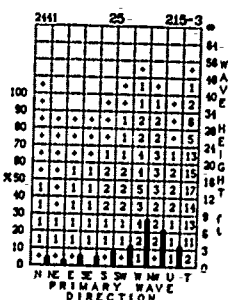
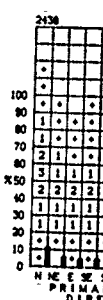
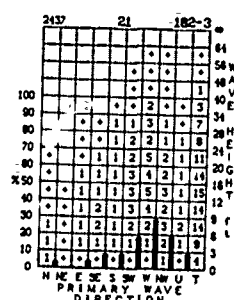
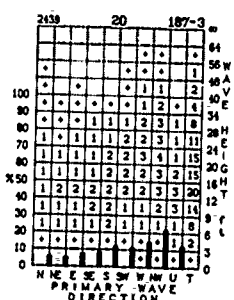
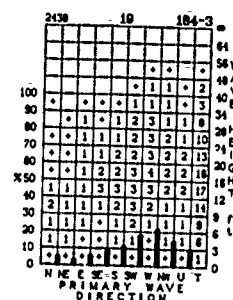
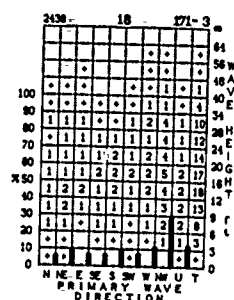
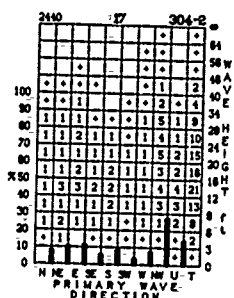
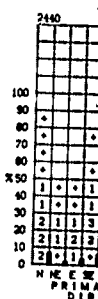
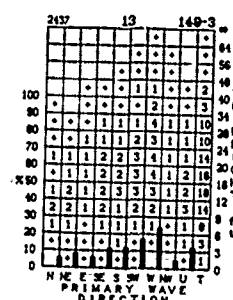
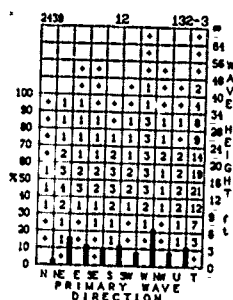
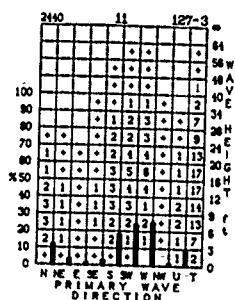
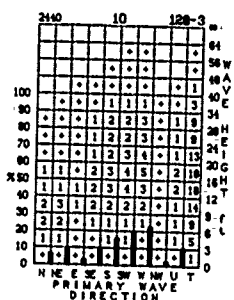
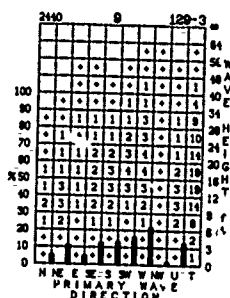
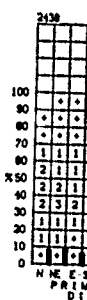
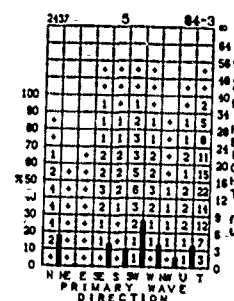
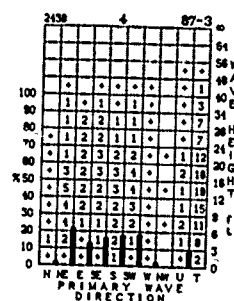
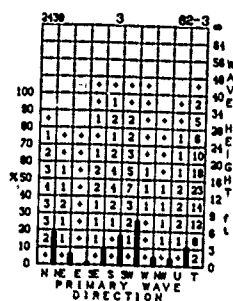
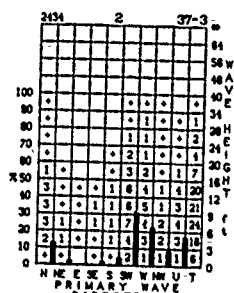
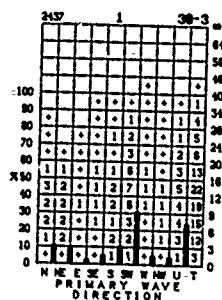
TY (Cont'd)

ANNUAL

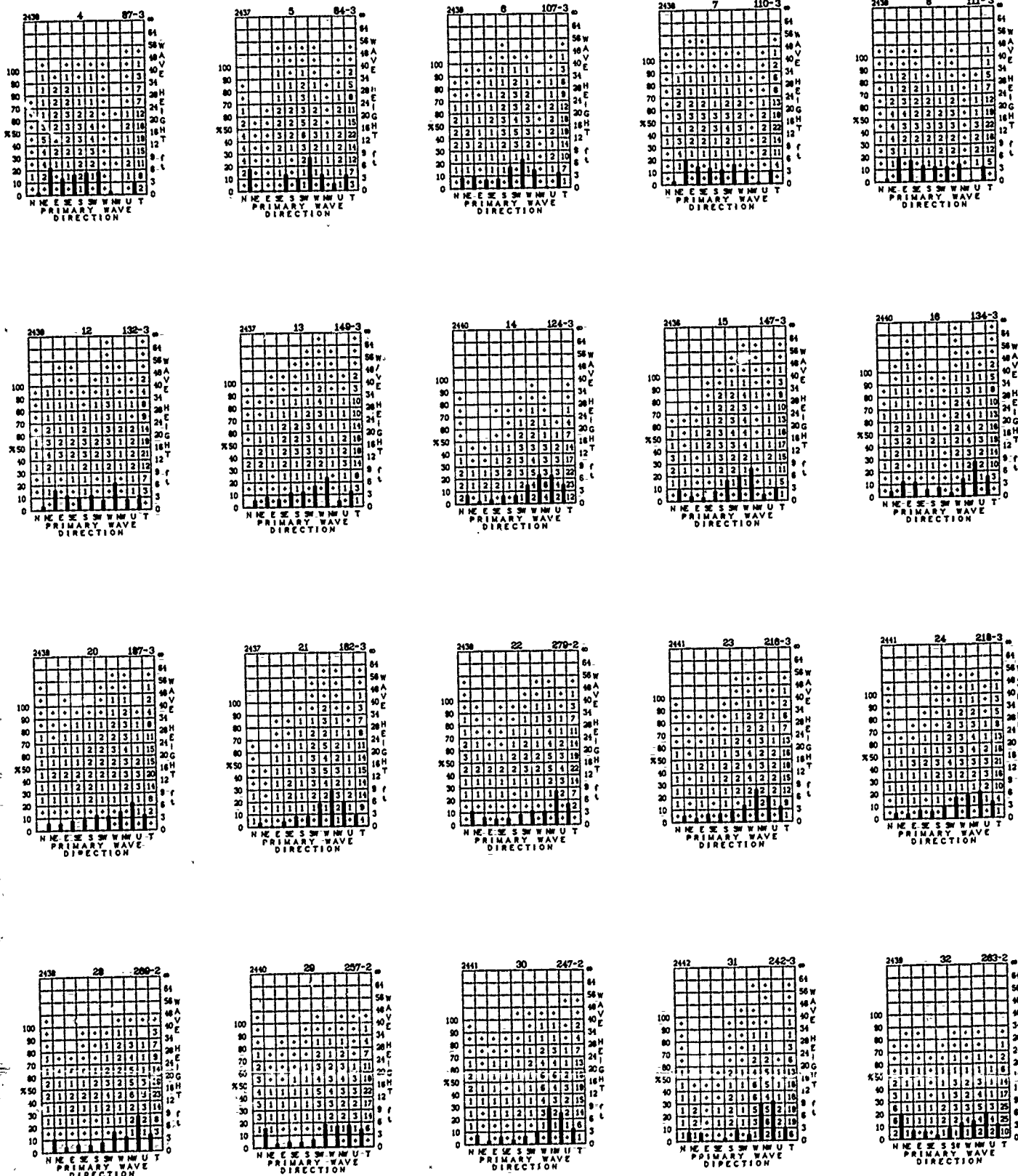


# JANUARY

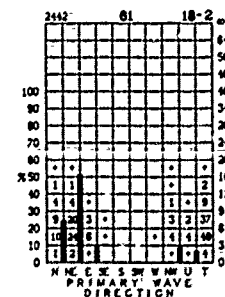
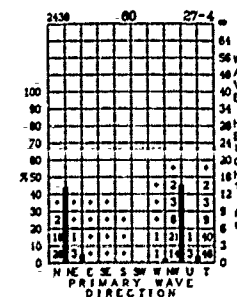
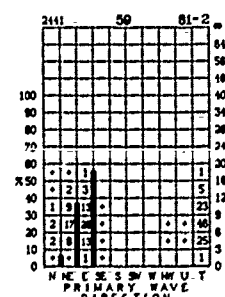
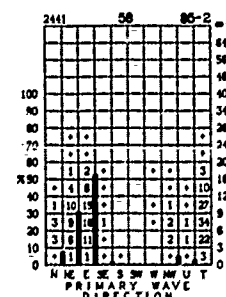
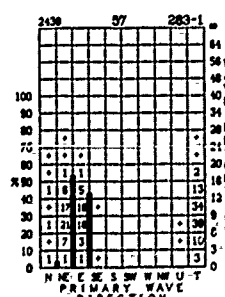
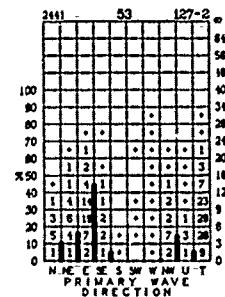
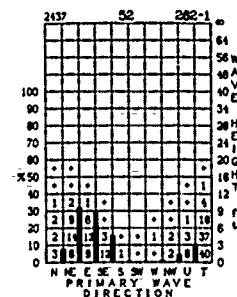
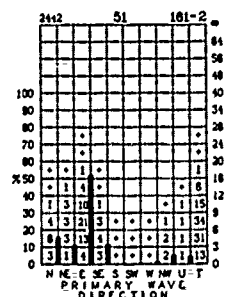
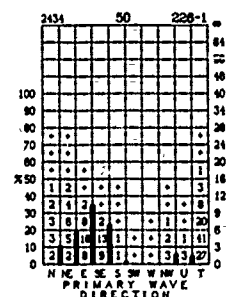
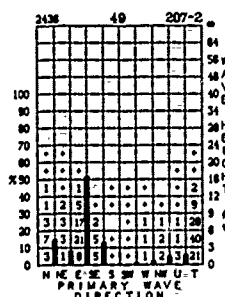
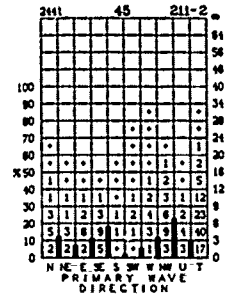
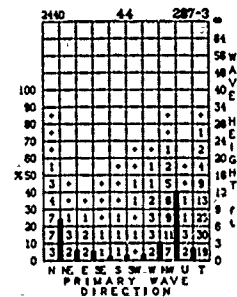
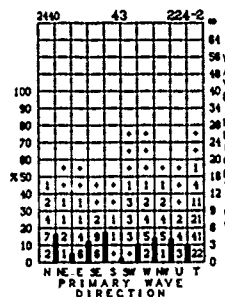
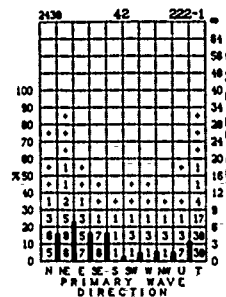
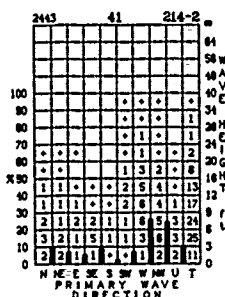
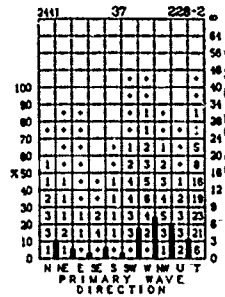
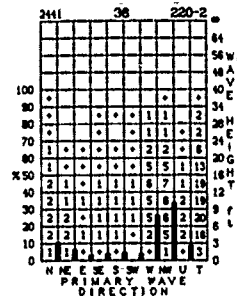
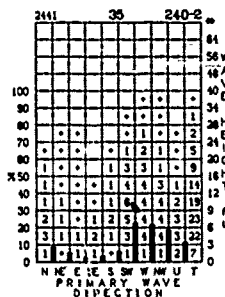
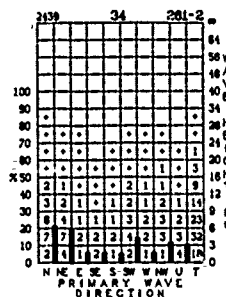
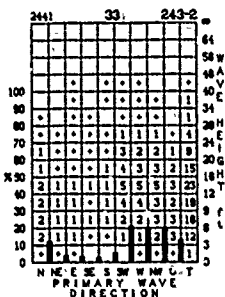
# WAVE HEIGHT AND



# WAVE HEIGHT AND PRIMARY WAVE DIRECTION



# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)

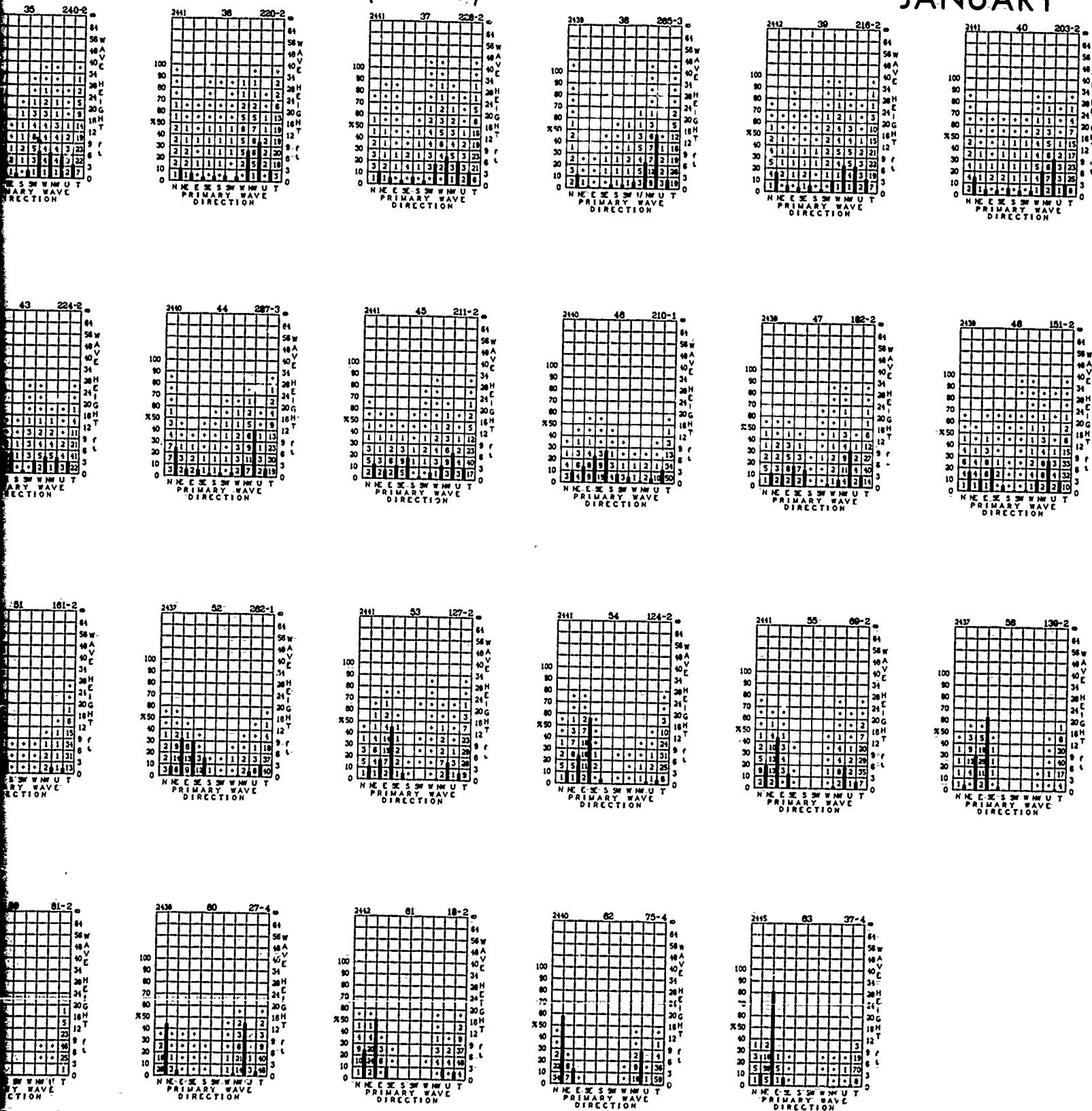


①



# PRIMARY WAVE DIRECTION (Cont'd)

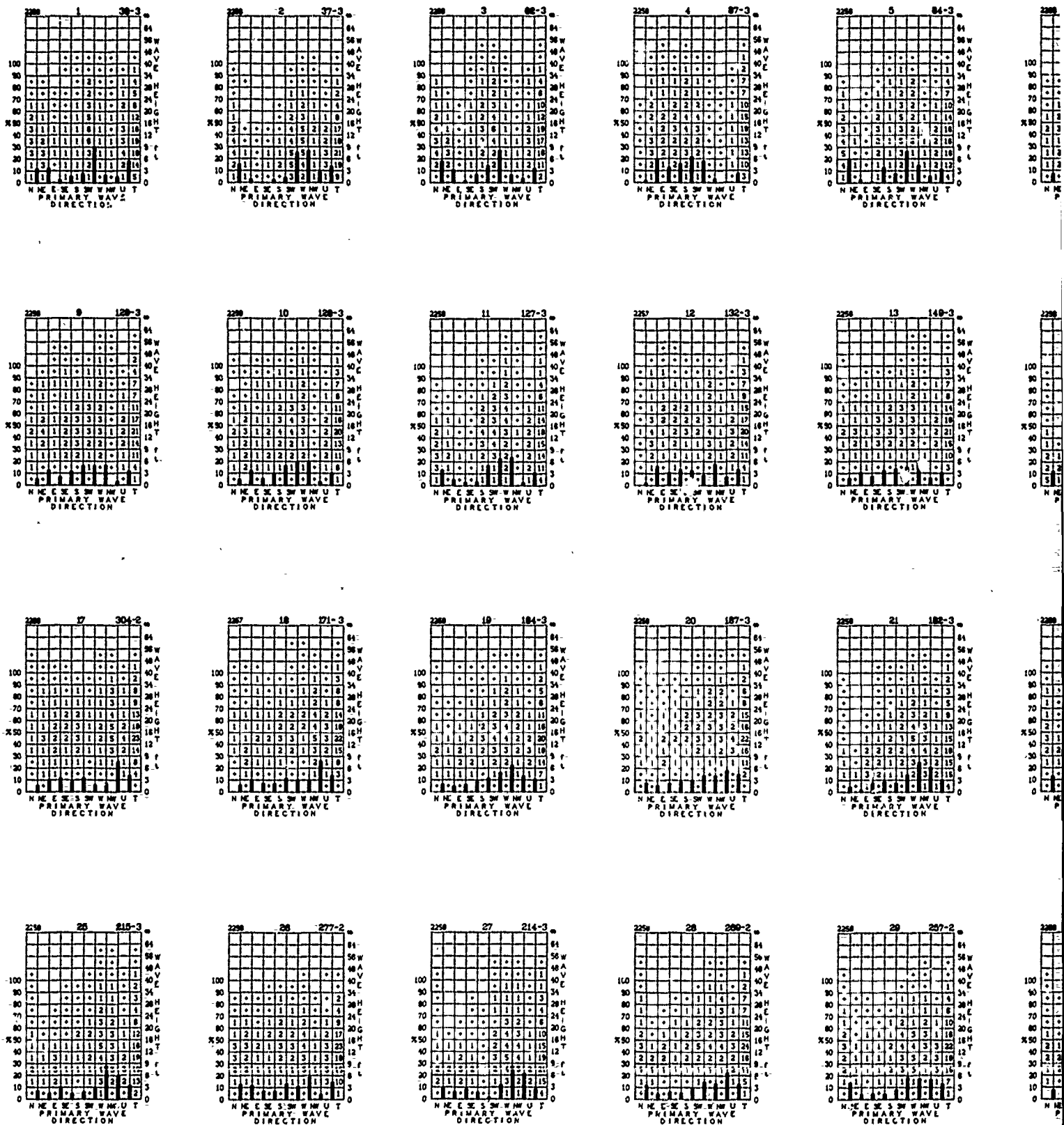
## JANUARY



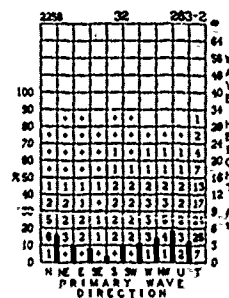
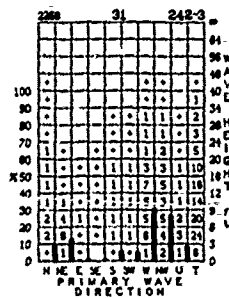
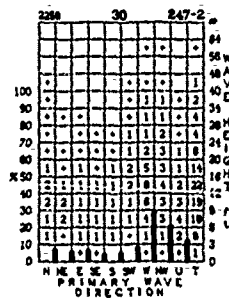
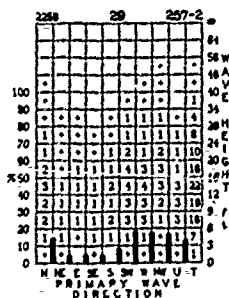
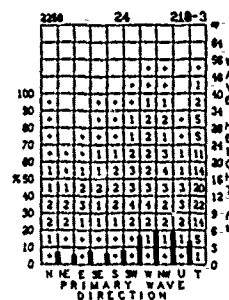
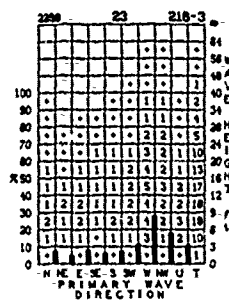
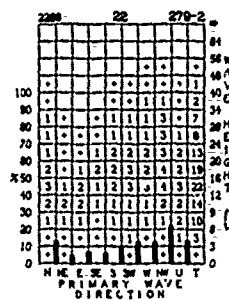
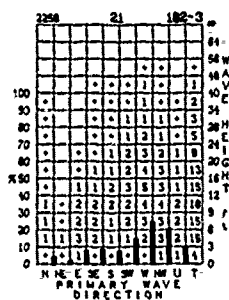
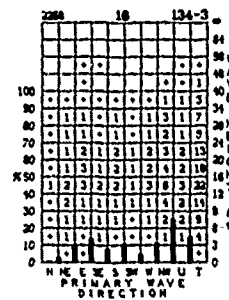
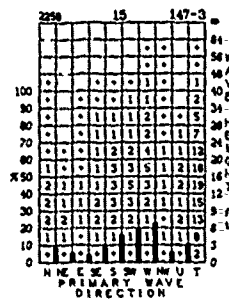
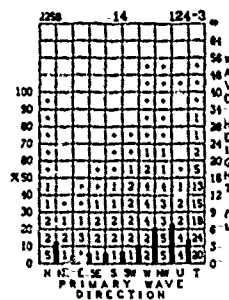
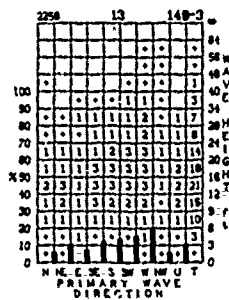
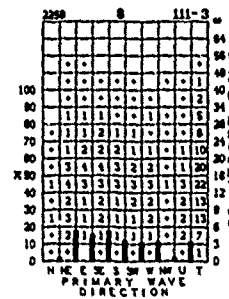
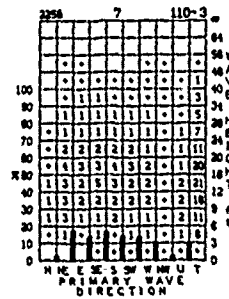
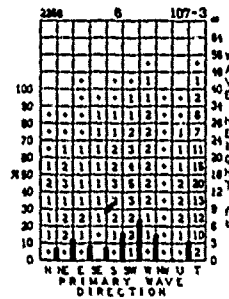
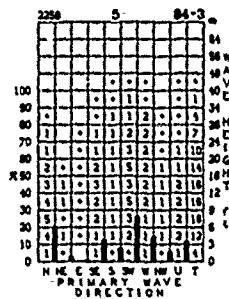


# FEBRUARY

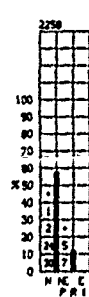
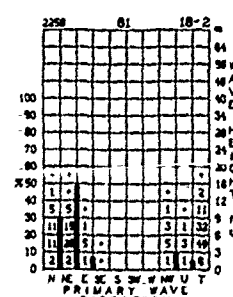
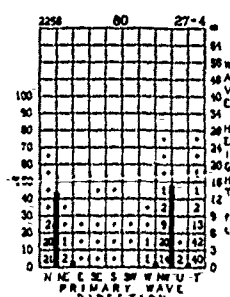
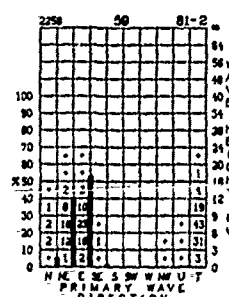
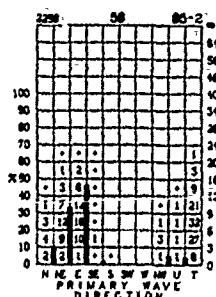
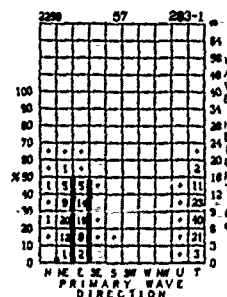
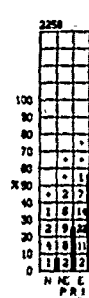
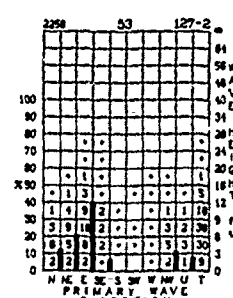
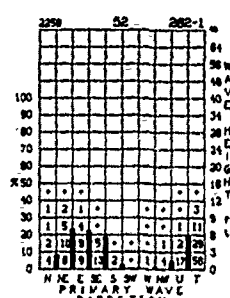
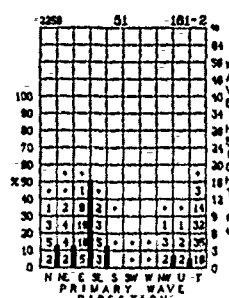
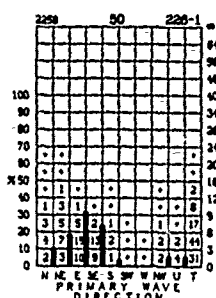
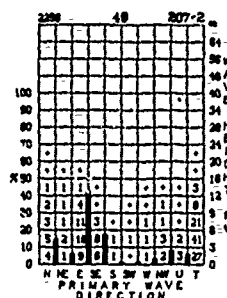
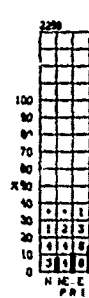
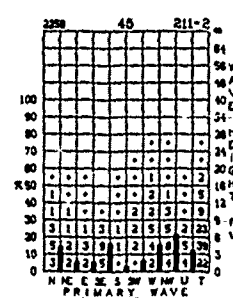
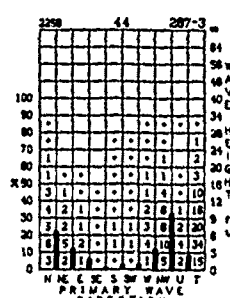
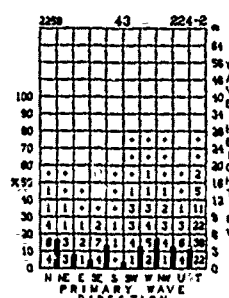
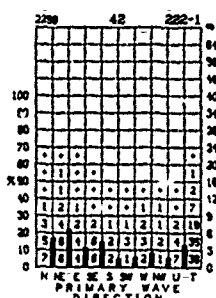
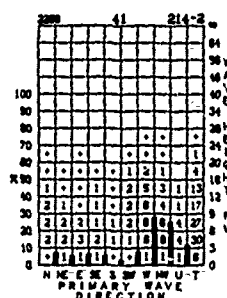
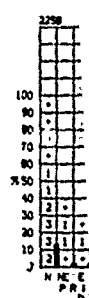
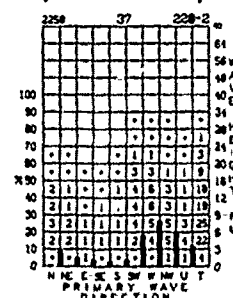
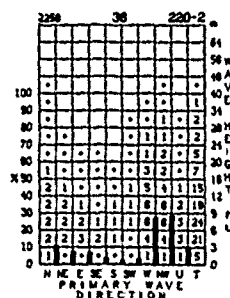
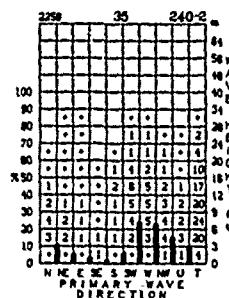
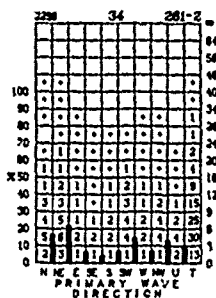
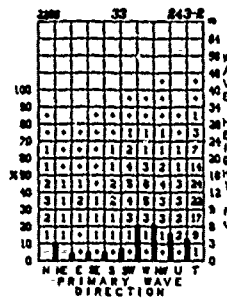
# WAVE HEIGHT AND



# WAVE HEIGHT AND PRIMARY WAVE DIRECTION

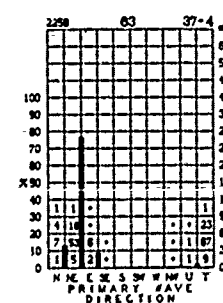
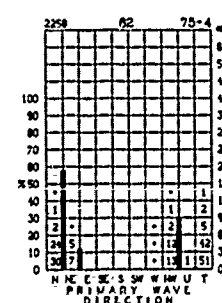
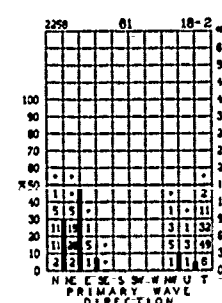
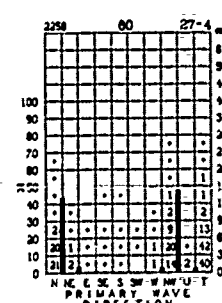
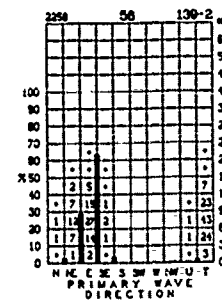
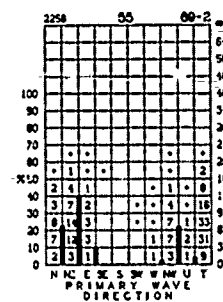
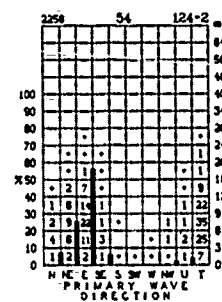
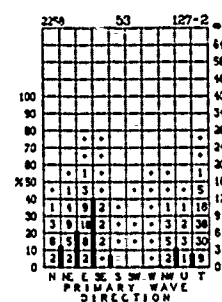
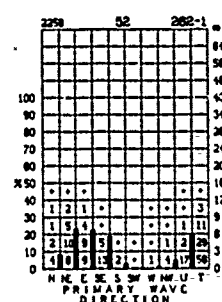
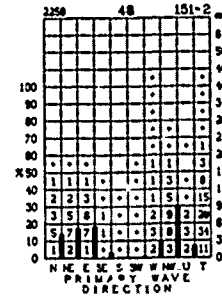
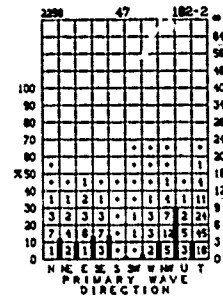
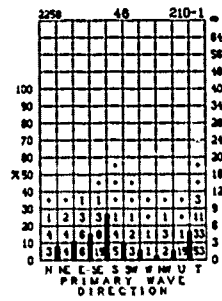
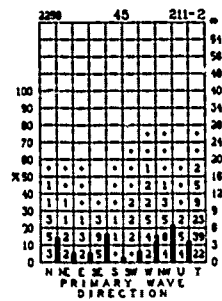
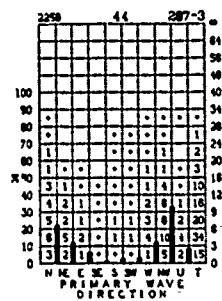
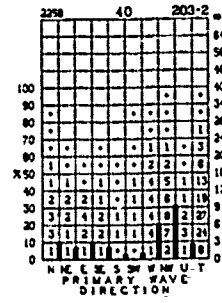
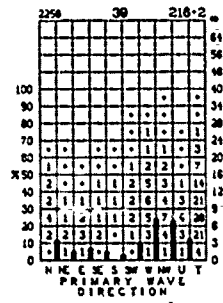
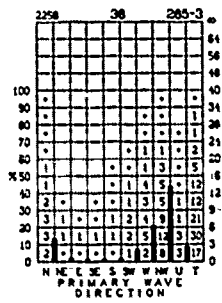
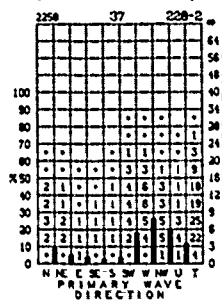
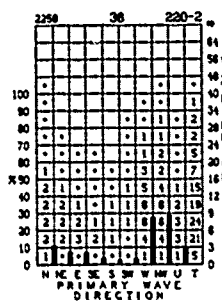


# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)



# AVE DIRECTION (Cont'd)

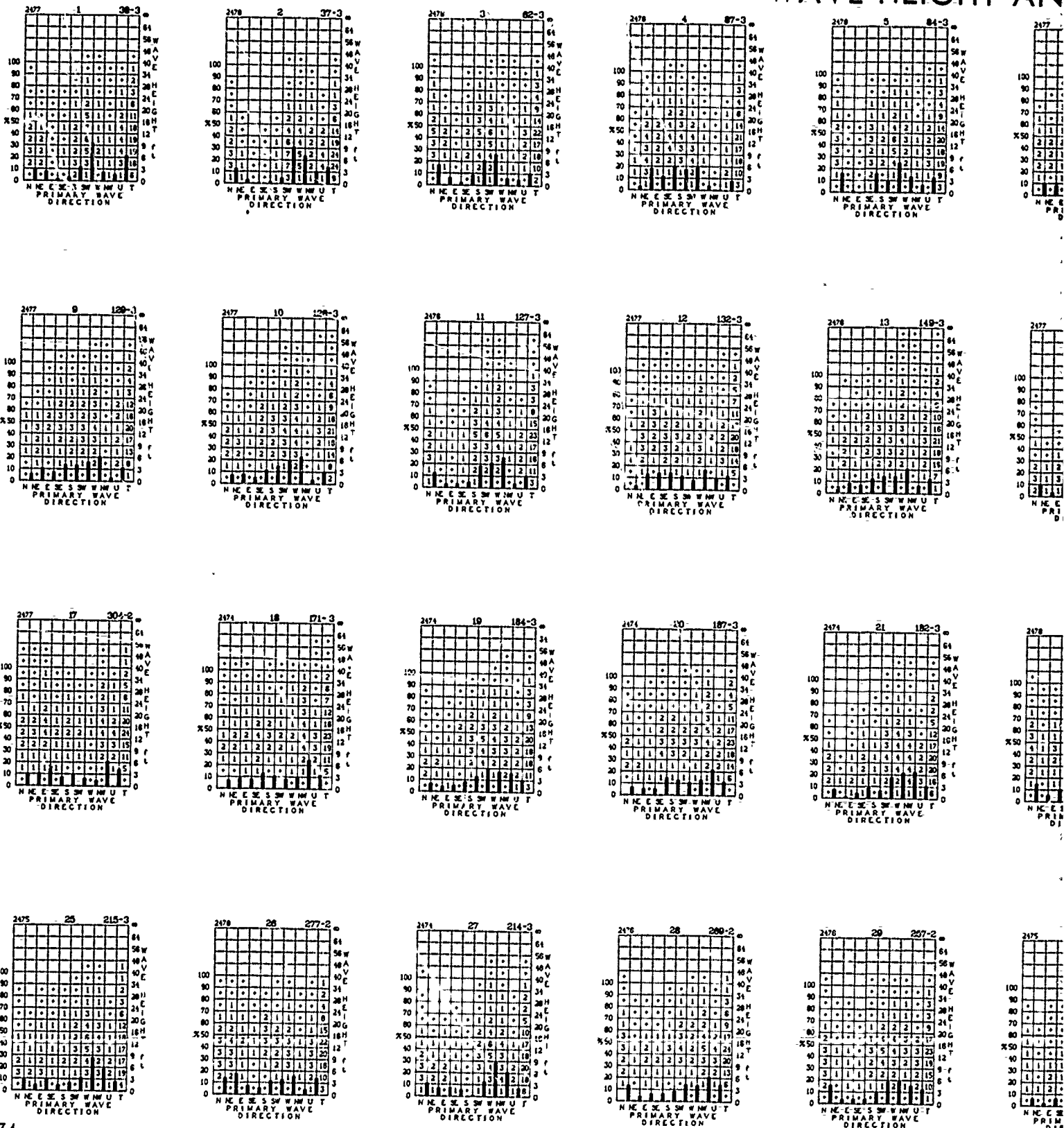
## FEBRUARY



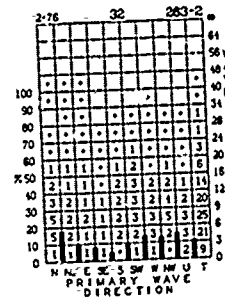
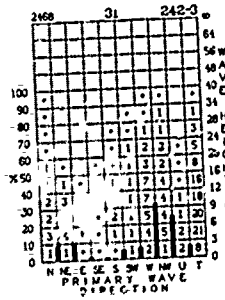
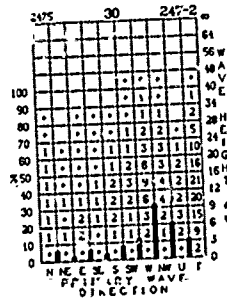
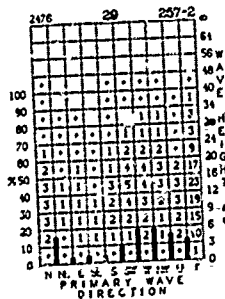
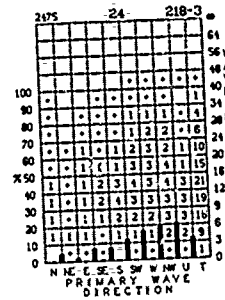
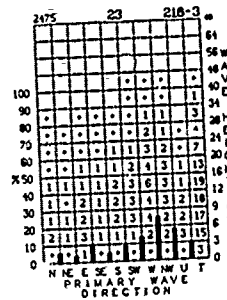
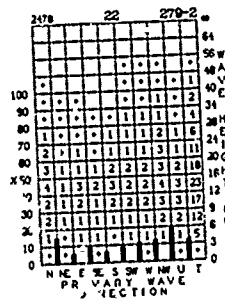
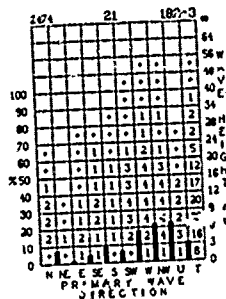
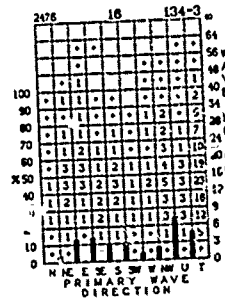
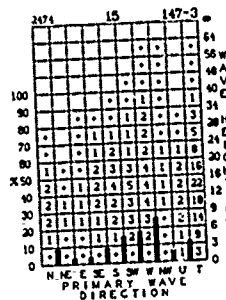
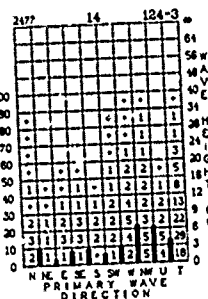
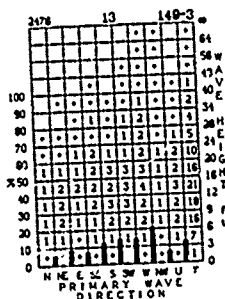
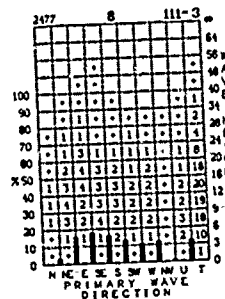
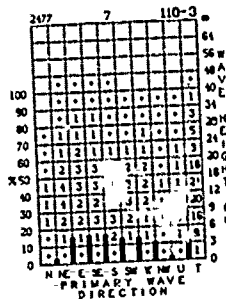
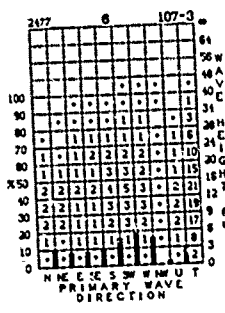
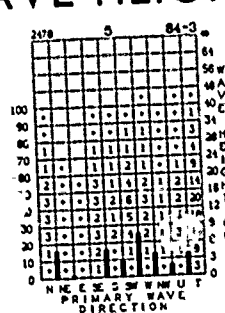
2

# MARCH

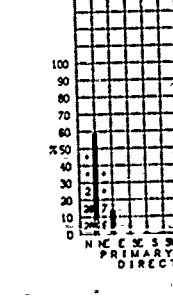
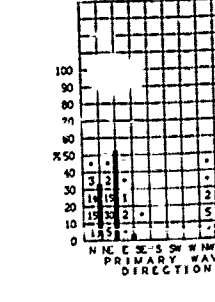
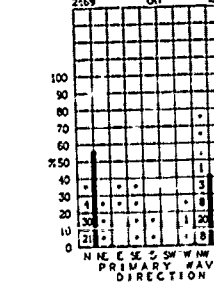
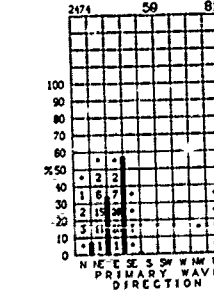
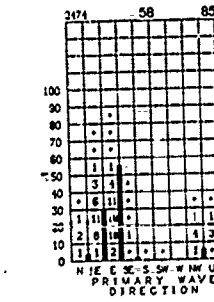
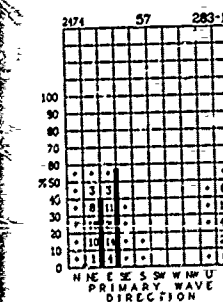
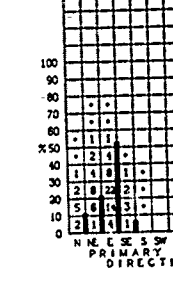
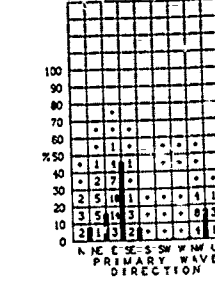
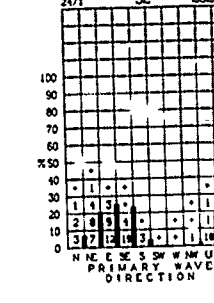
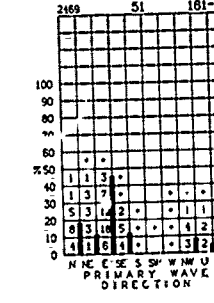
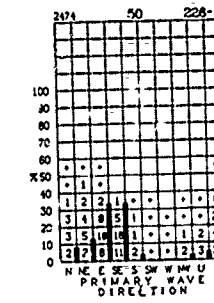
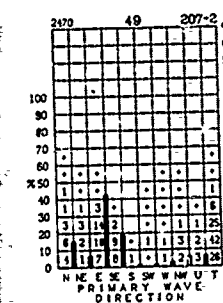
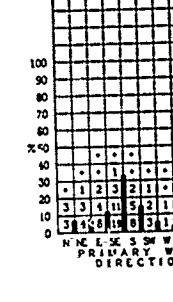
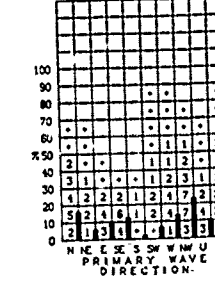
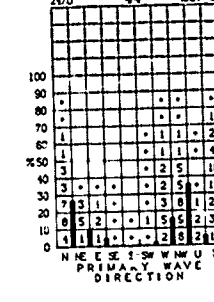
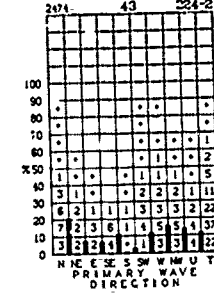
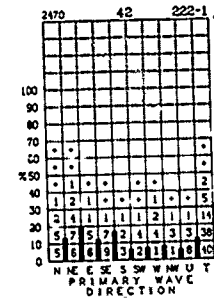
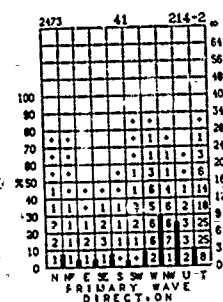
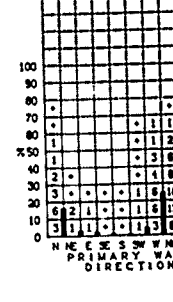
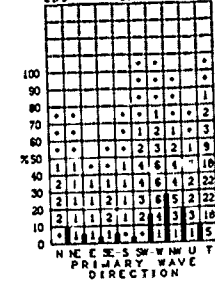
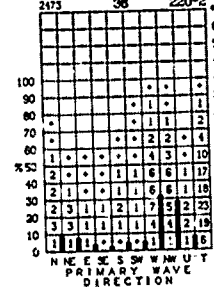
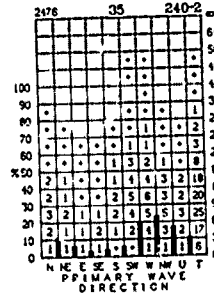
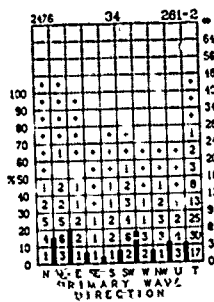
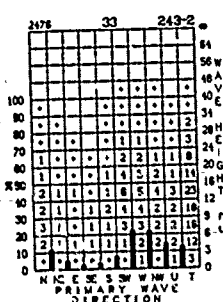
# WAVE HEIGHT AND



# WAVE HEIGHT AND PRIMARY WAVE DIRECTION



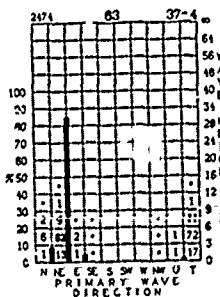
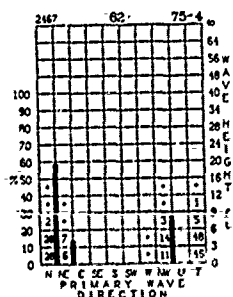
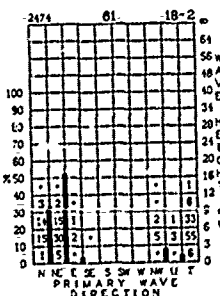
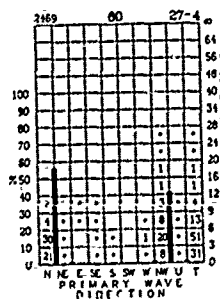
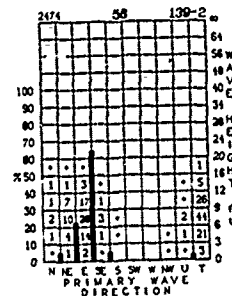
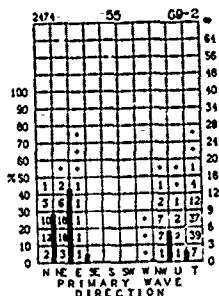
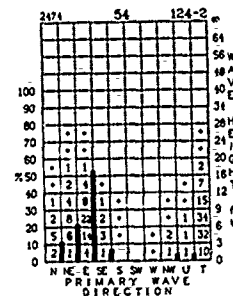
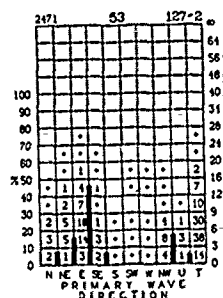
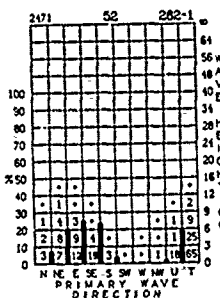
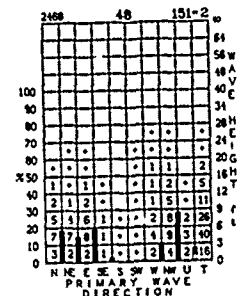
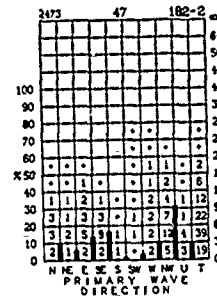
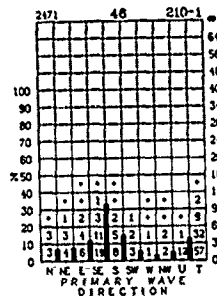
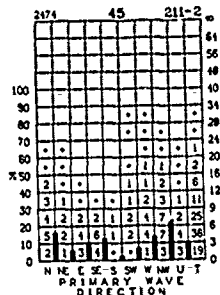
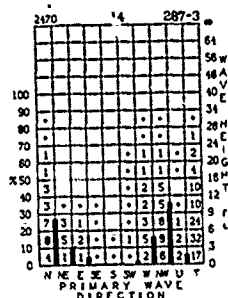
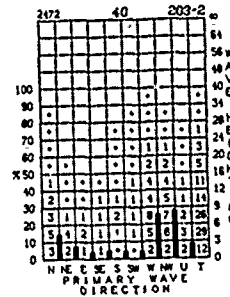
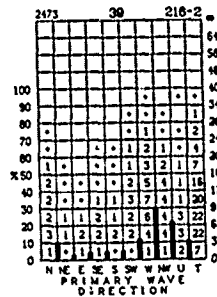
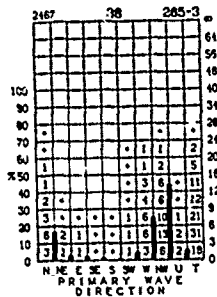
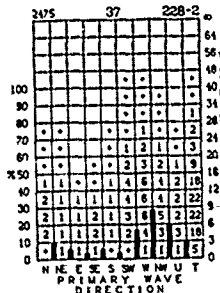
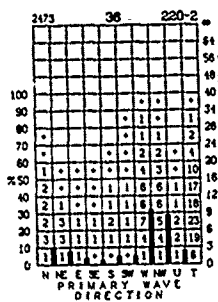
# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)





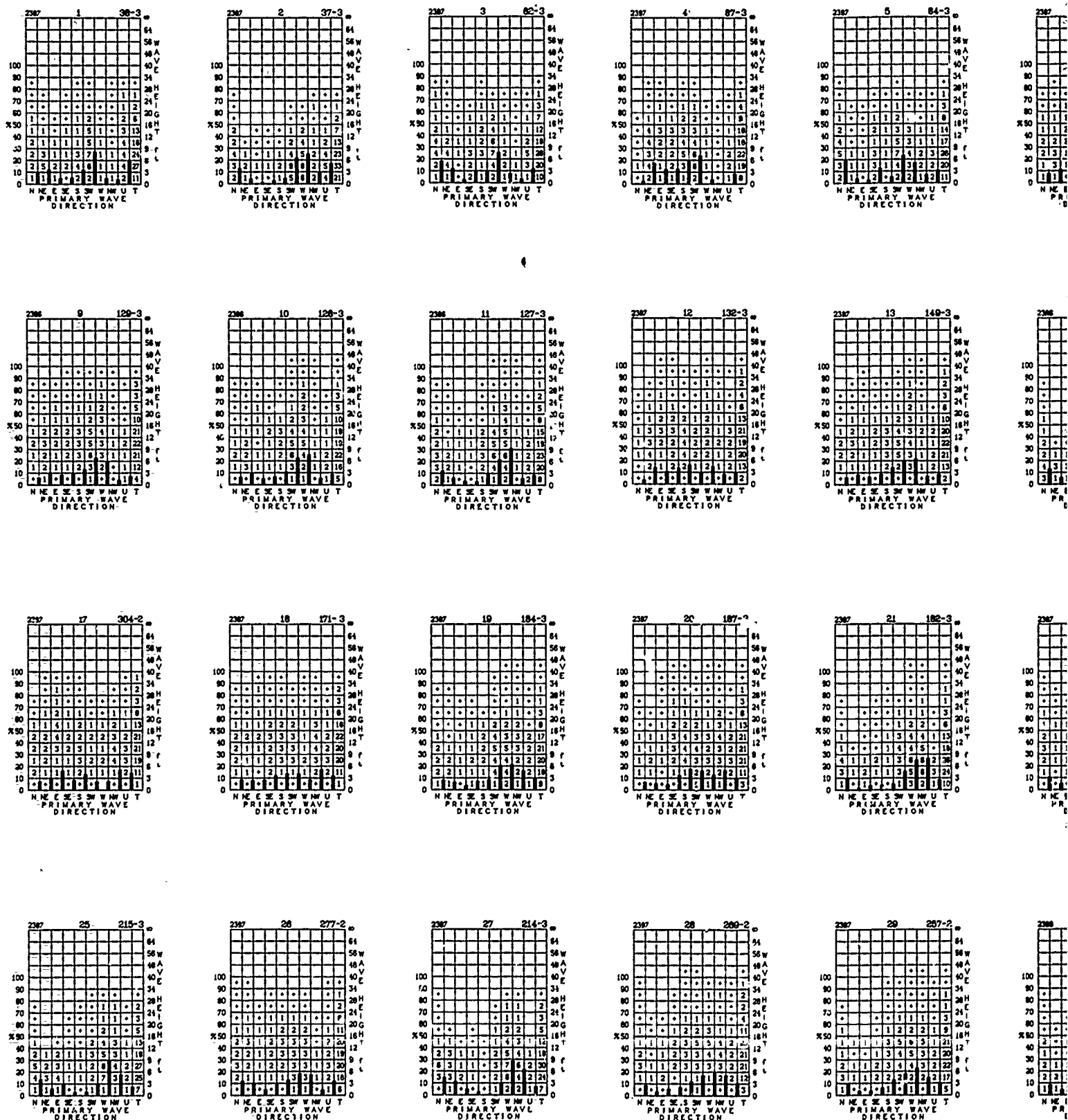
# VE DIRECTION (Cont'd)

MARCH

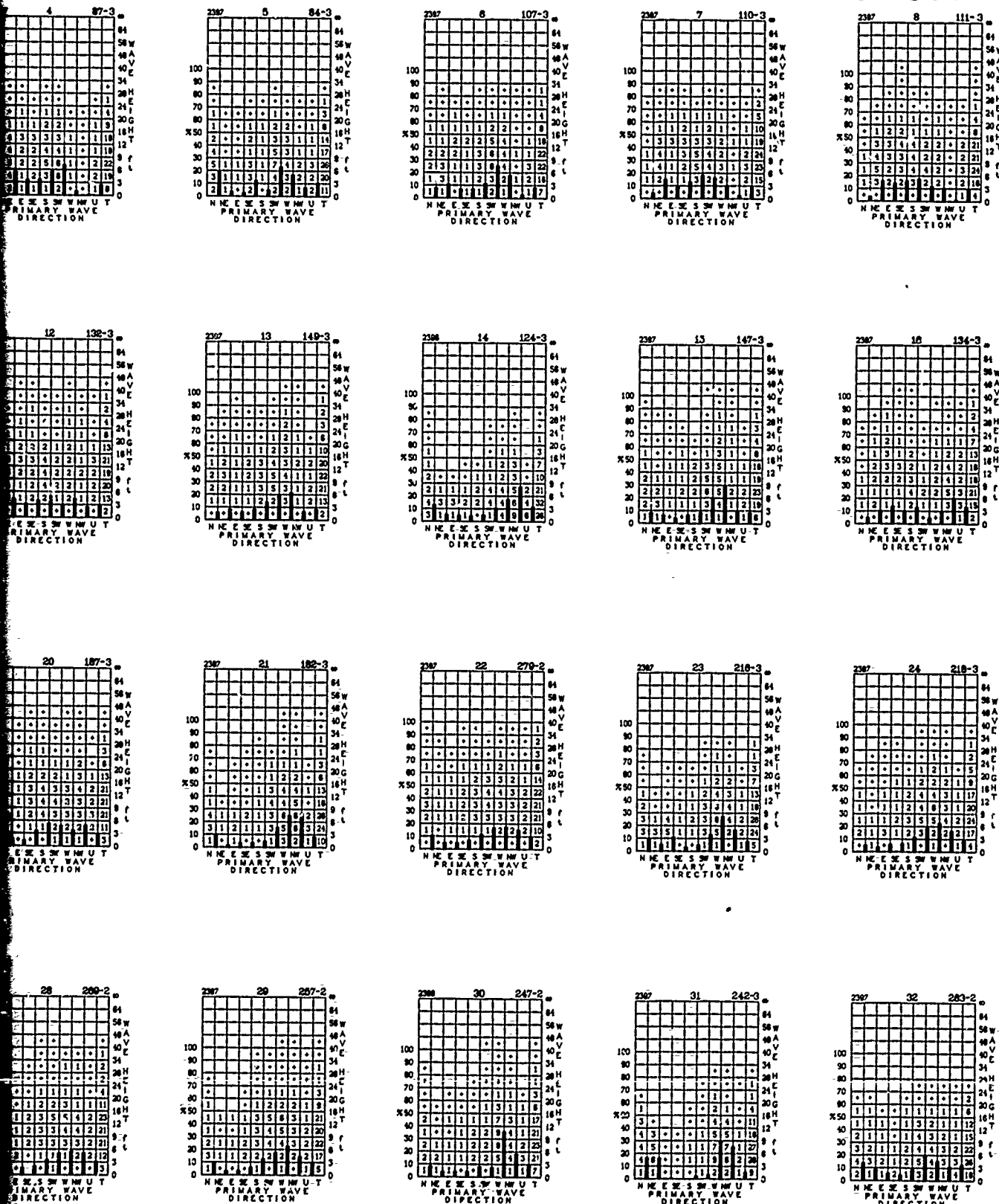


# APRIL

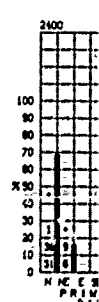
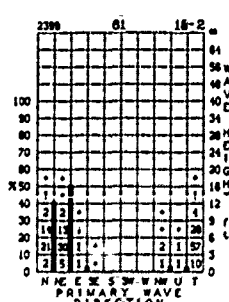
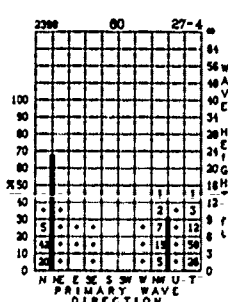
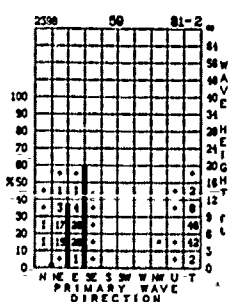
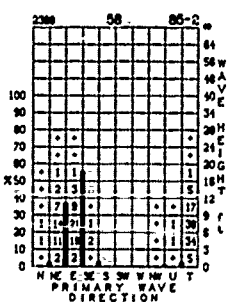
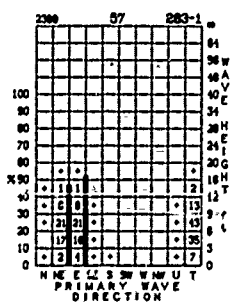
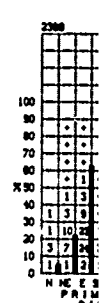
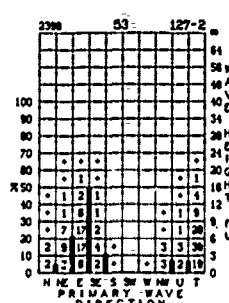
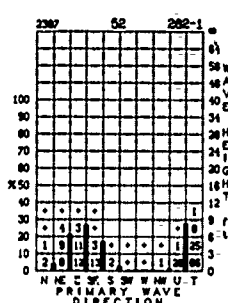
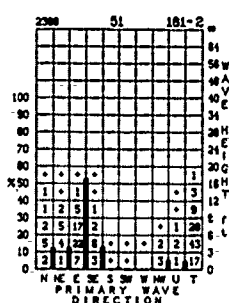
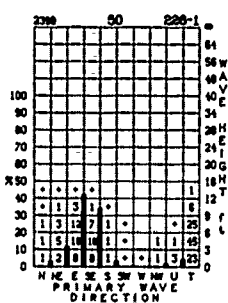
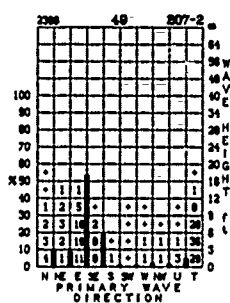
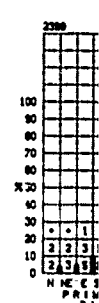
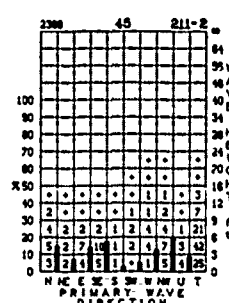
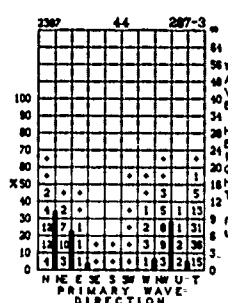
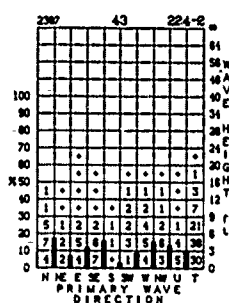
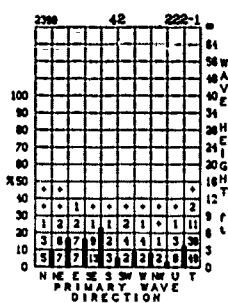
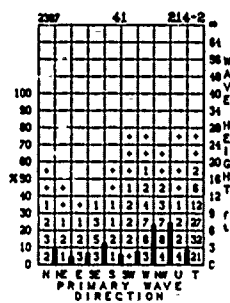
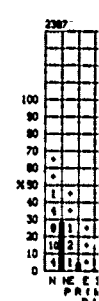
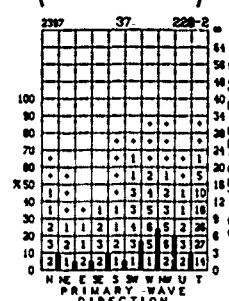
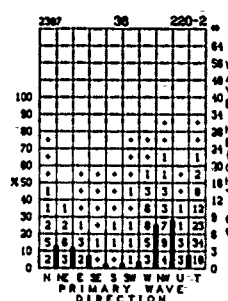
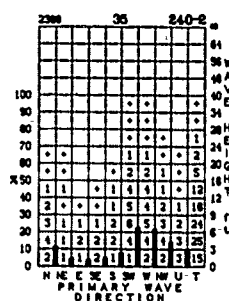
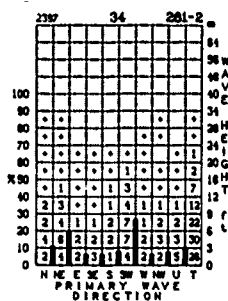
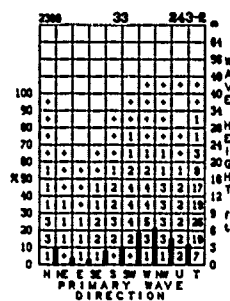
# WAVE HEIGHT AND



# WAVE HEIGHT AND PRIMARY WAVE DIRECTION

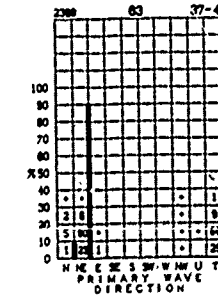
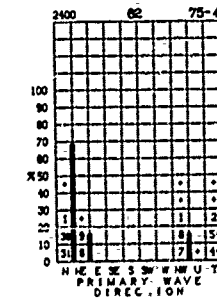
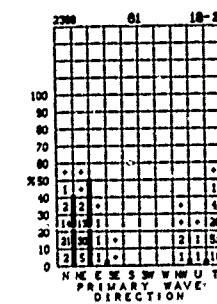
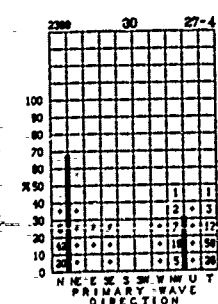
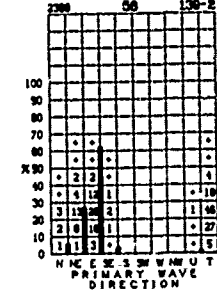
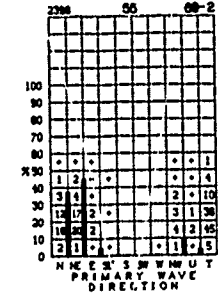
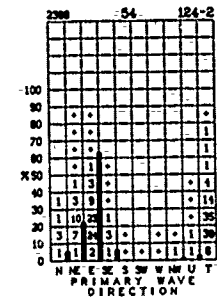
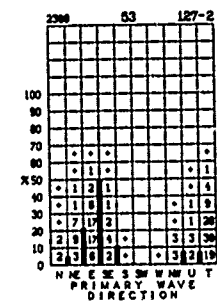
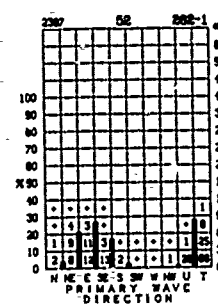
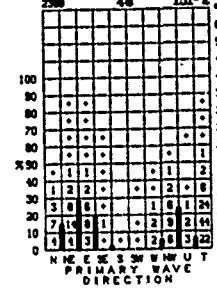
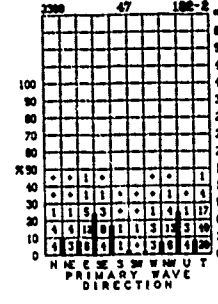
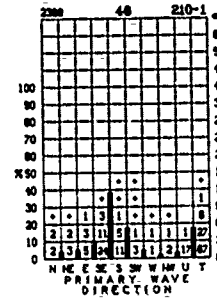
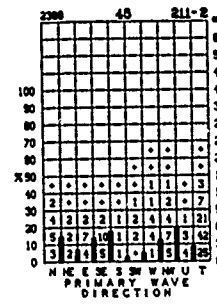
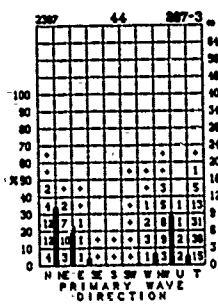
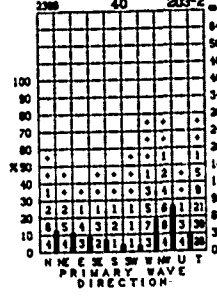
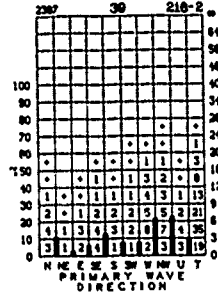
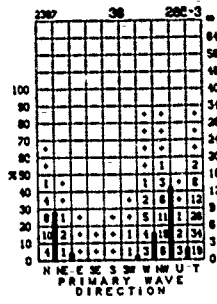
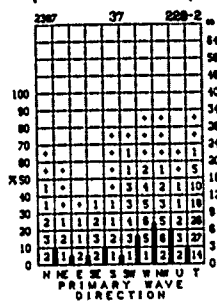
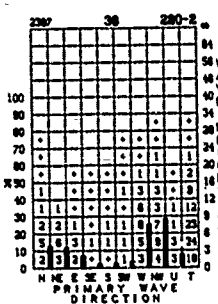


# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)



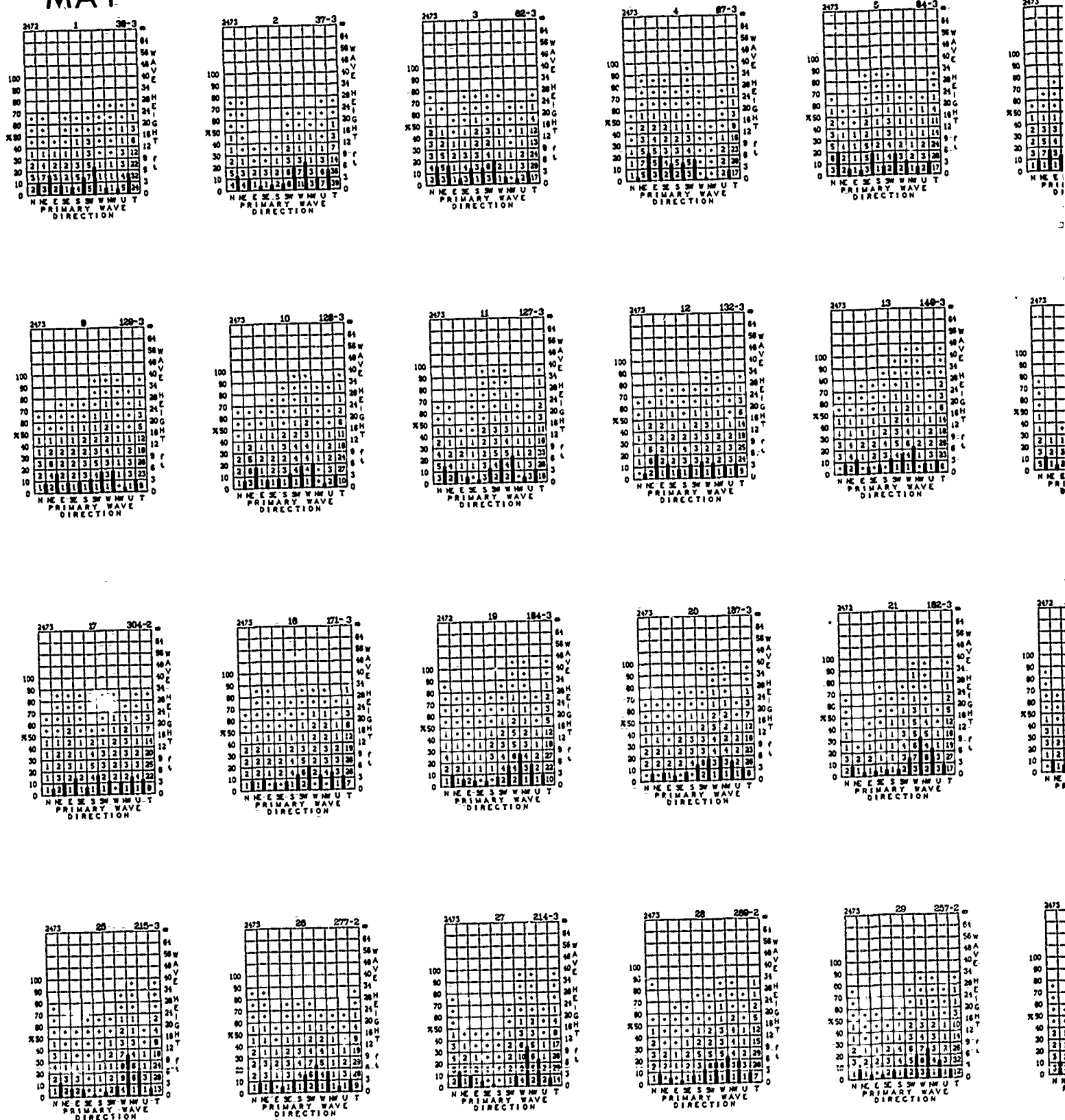
# WAVE DIRECTION (Cont'd)

APRIL

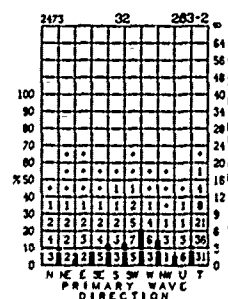
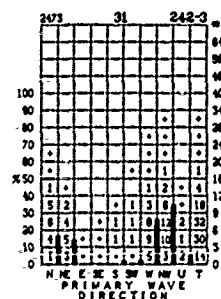
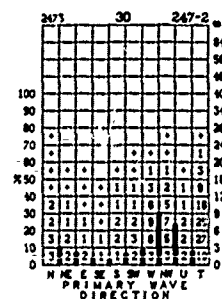
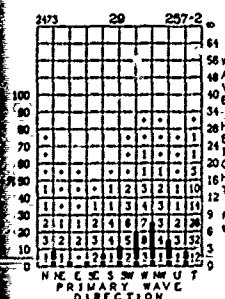
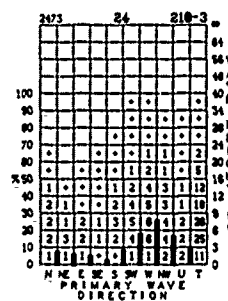
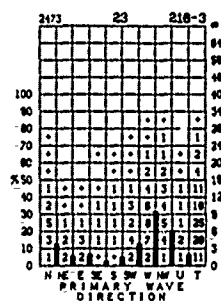
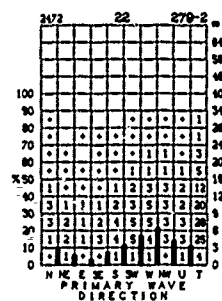
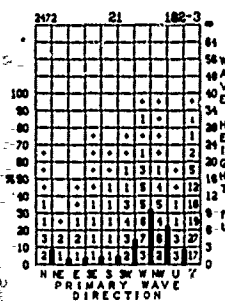
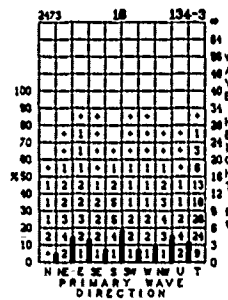
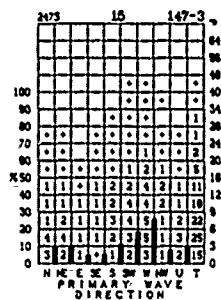
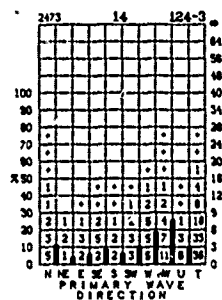
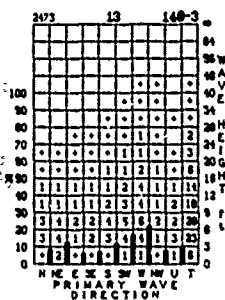
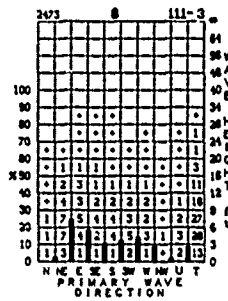
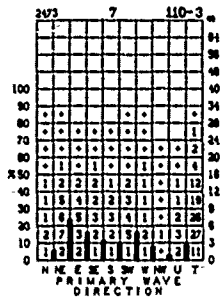
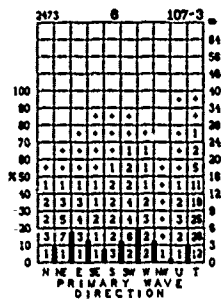
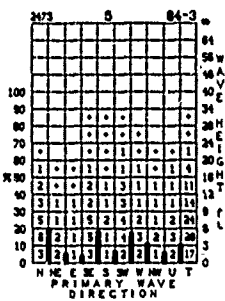


# MAY

# WAVE HEIGHT AND

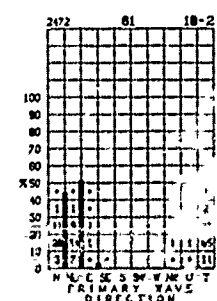
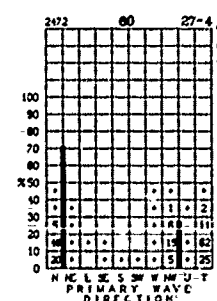
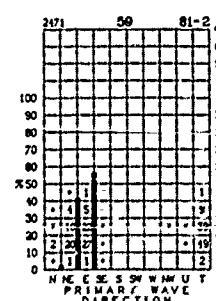
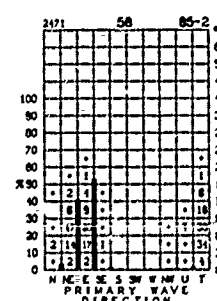
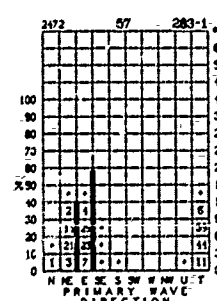
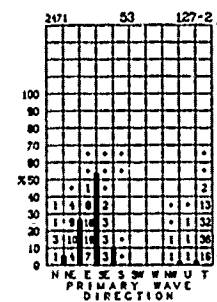
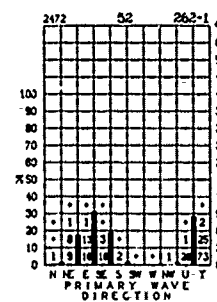
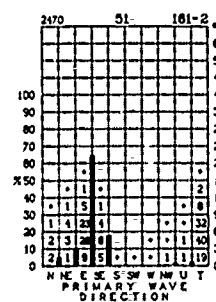
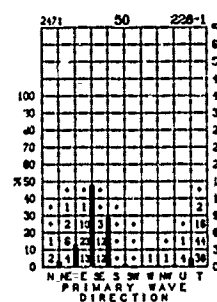
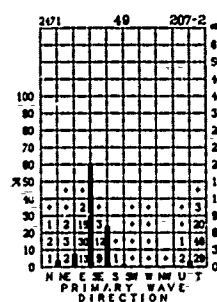
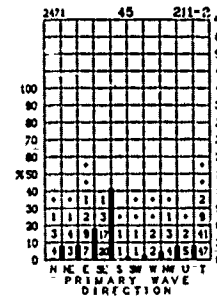
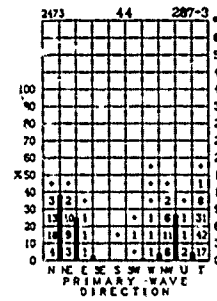
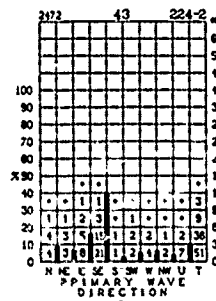
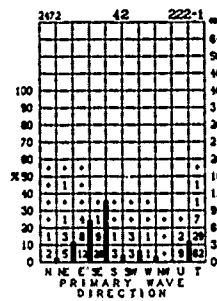
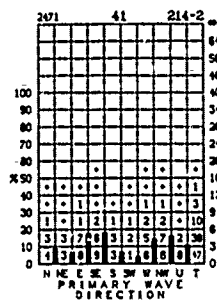
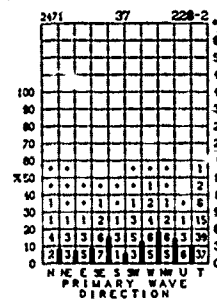
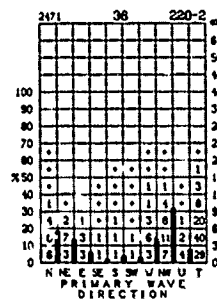
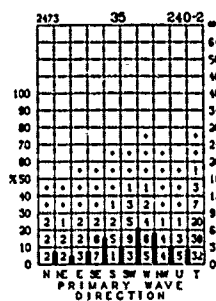
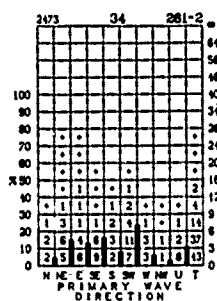
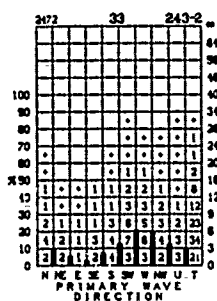


# AVE HEIGHT AND PRIMARY WAVE DIRECTION



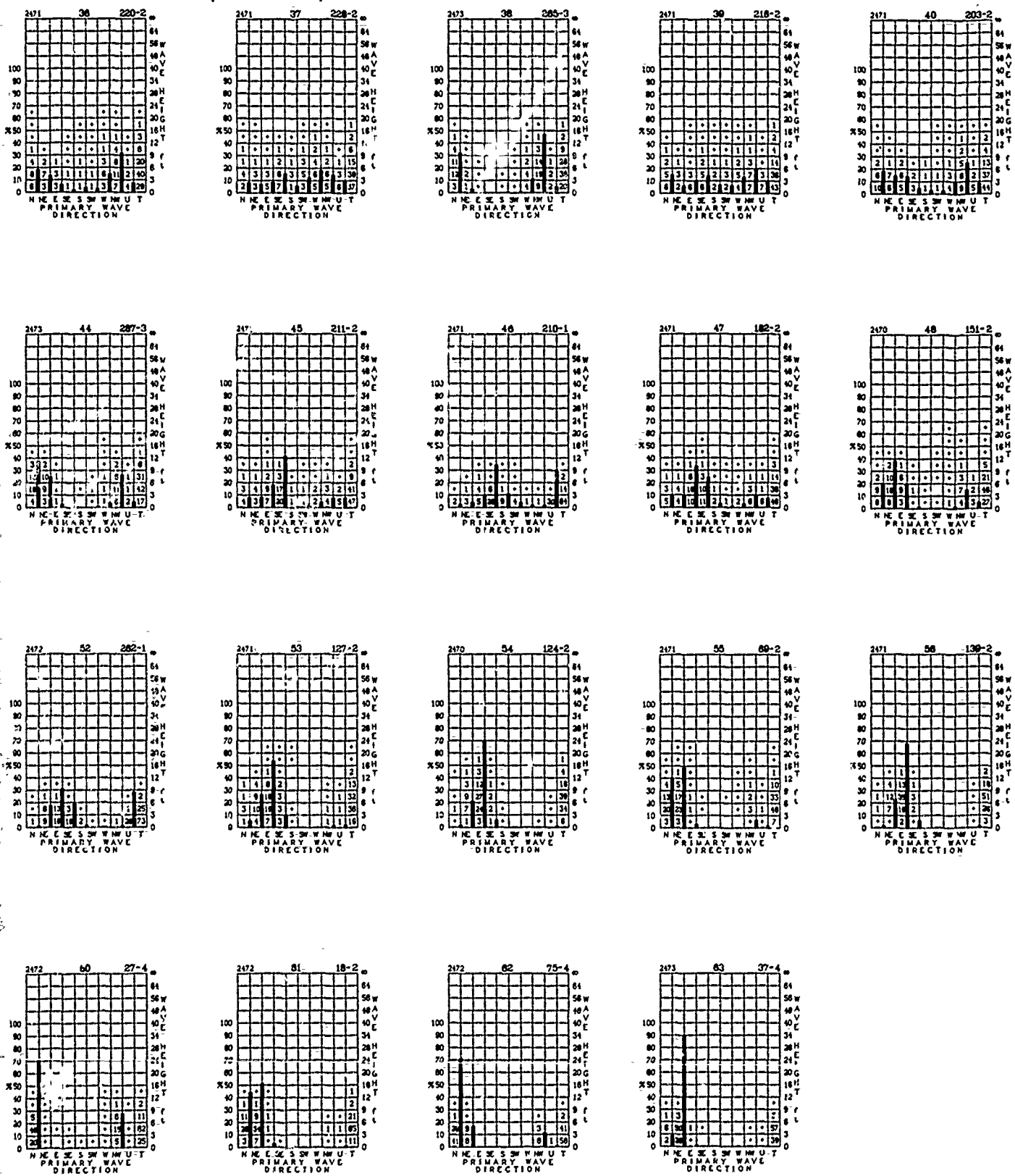


# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)



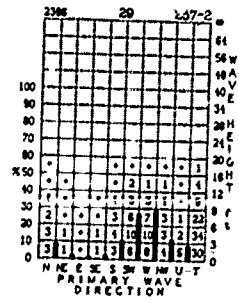
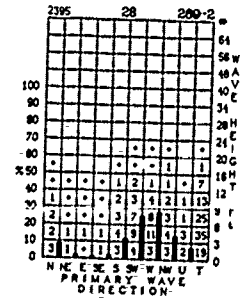
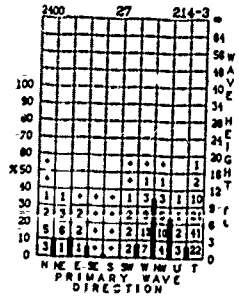
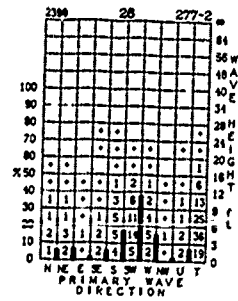
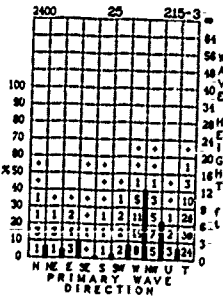
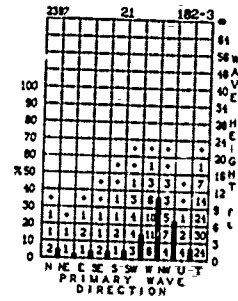
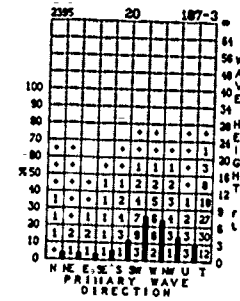
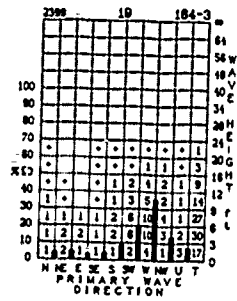
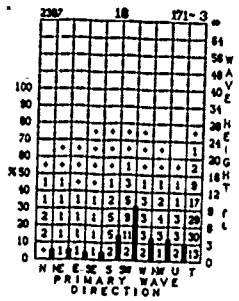
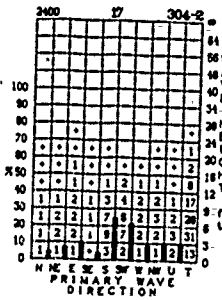
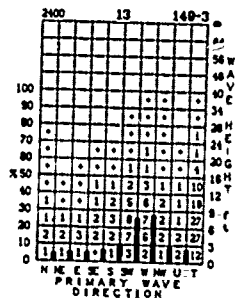
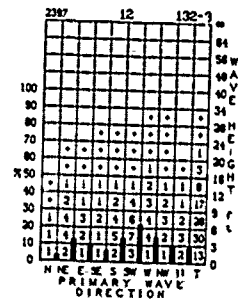
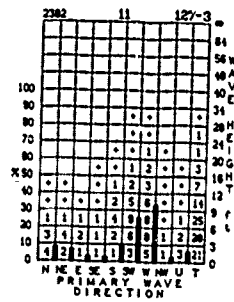
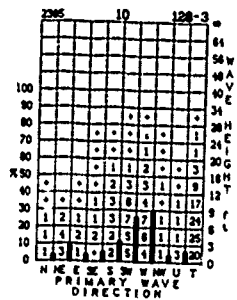
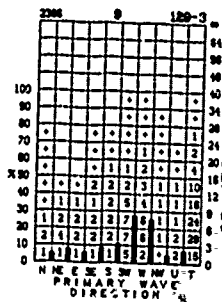
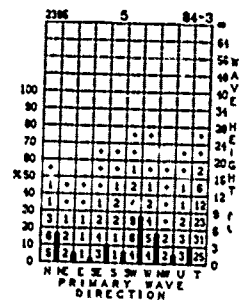
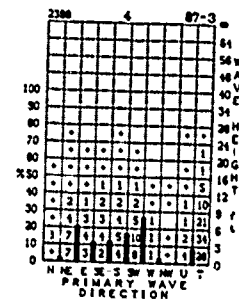
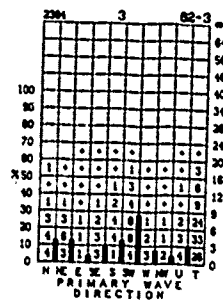
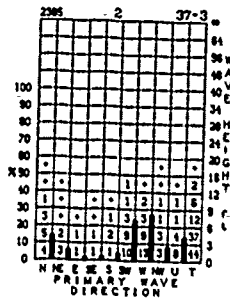
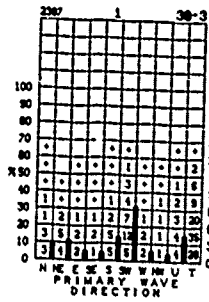
E DIRECTION (Cont'd)

MAY

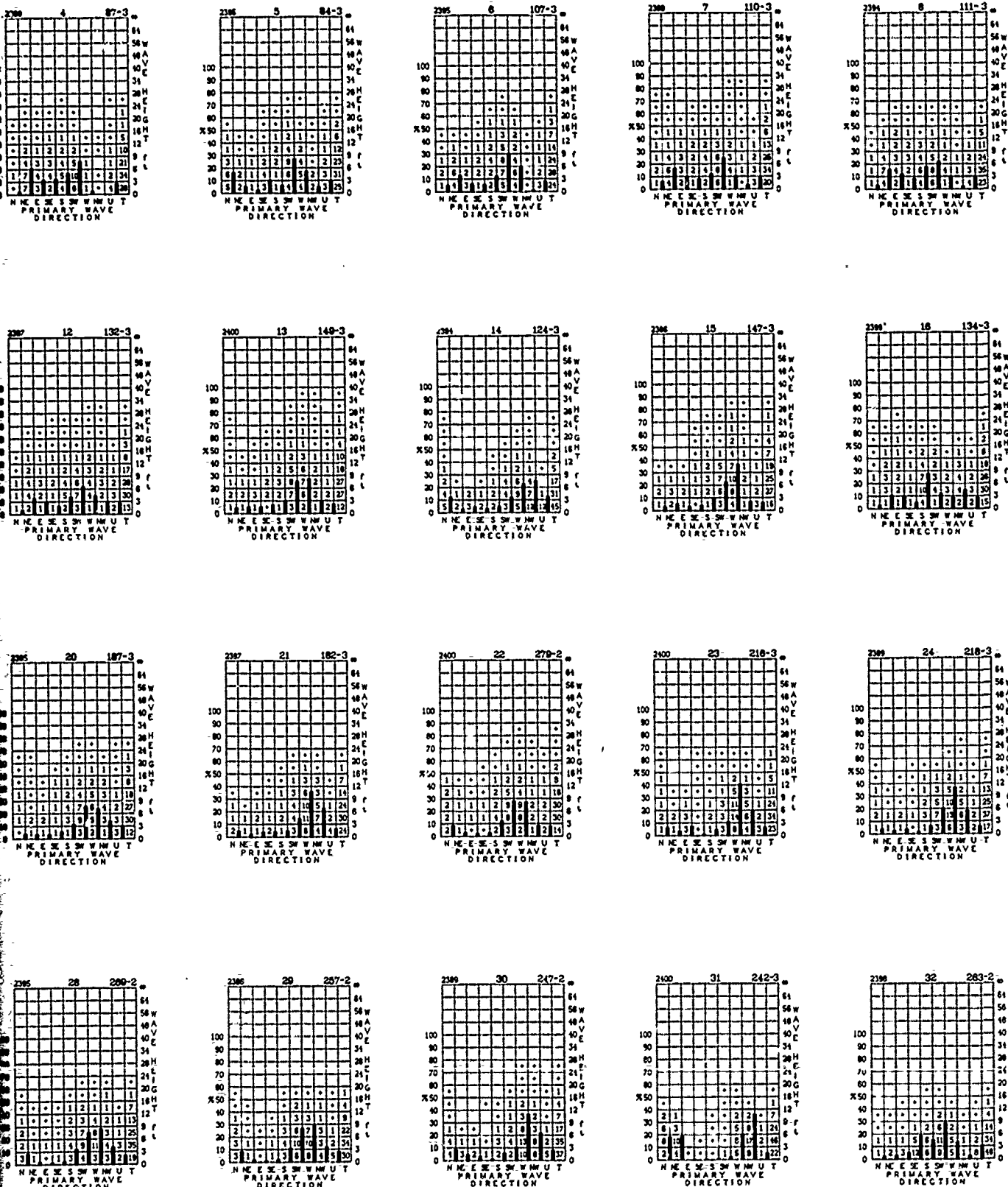


# JUNE

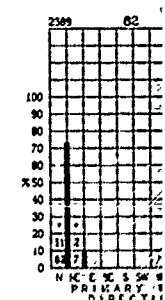
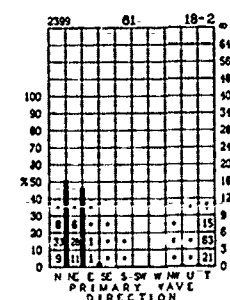
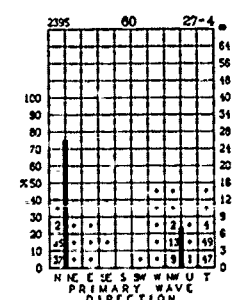
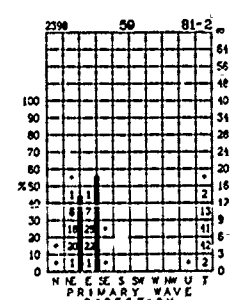
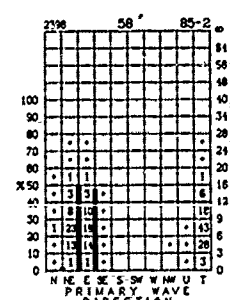
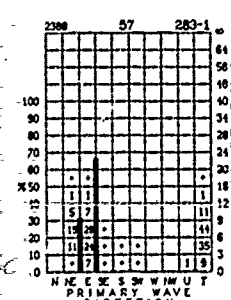
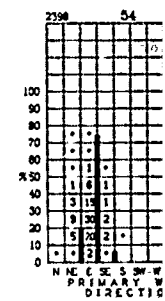
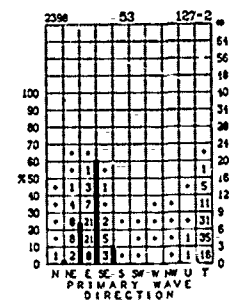
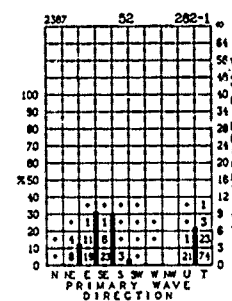
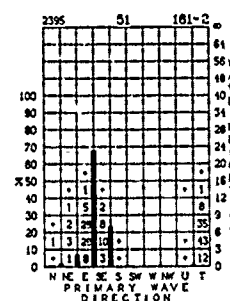
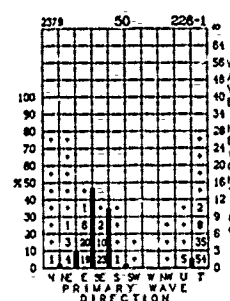
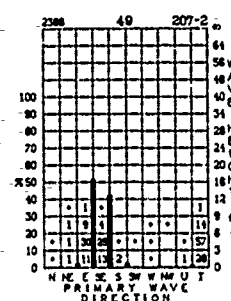
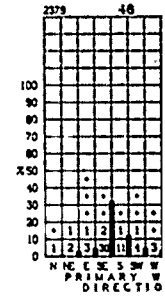
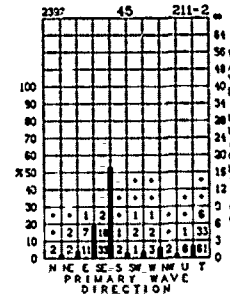
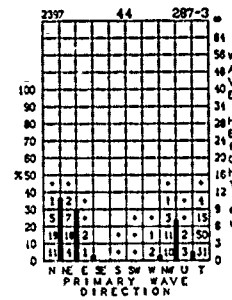
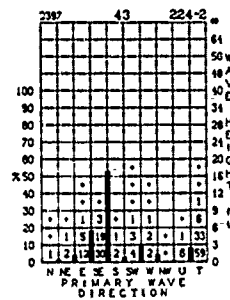
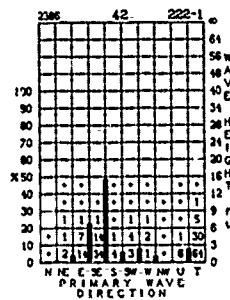
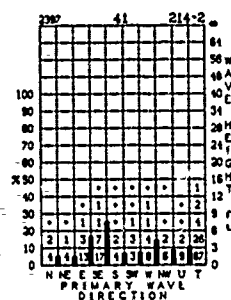
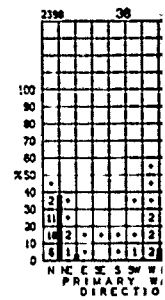
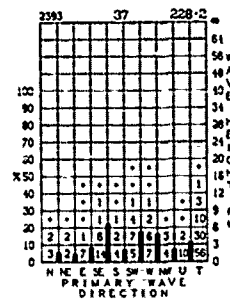
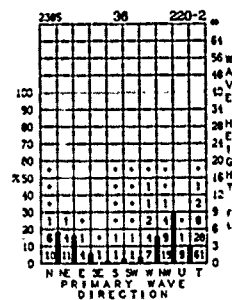
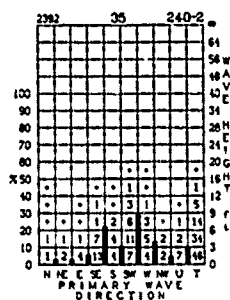
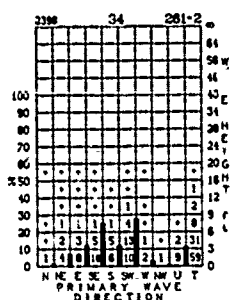
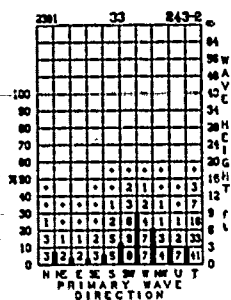
# WAVE HEIGHT



# WAVE HEIGHT AND PRIMARY WAVE DIRECTION

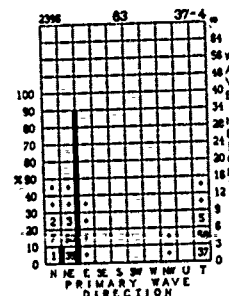
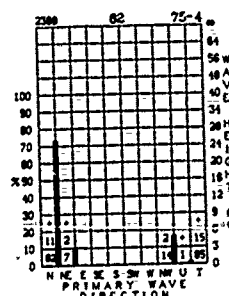
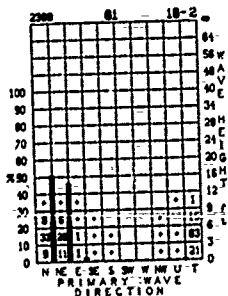
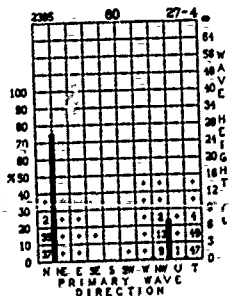
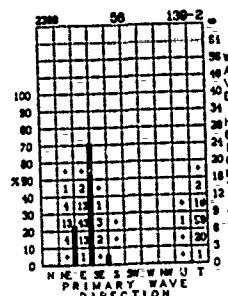
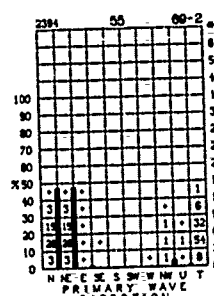
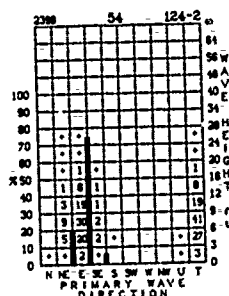
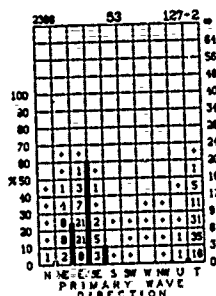
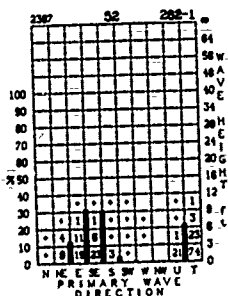
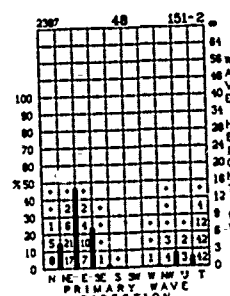
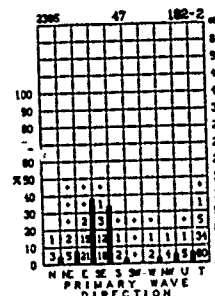
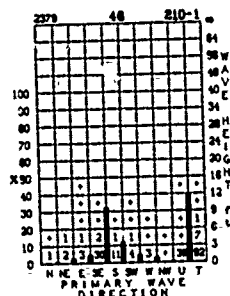
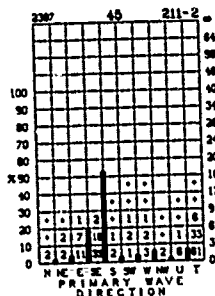
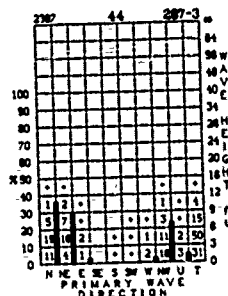
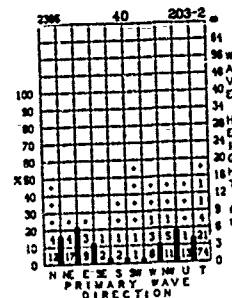
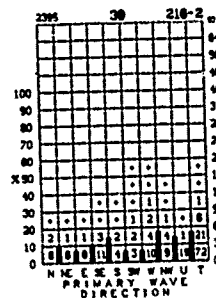
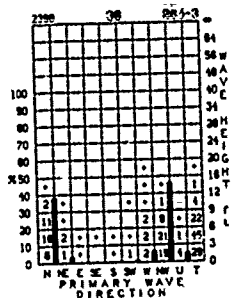
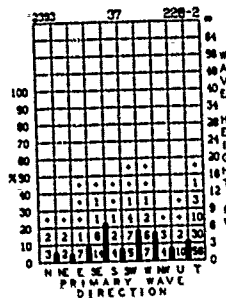
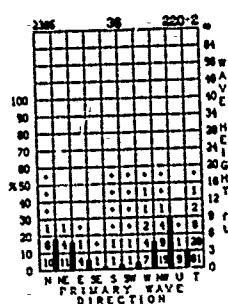


# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)



# VE DIRECTION (Cont'd)

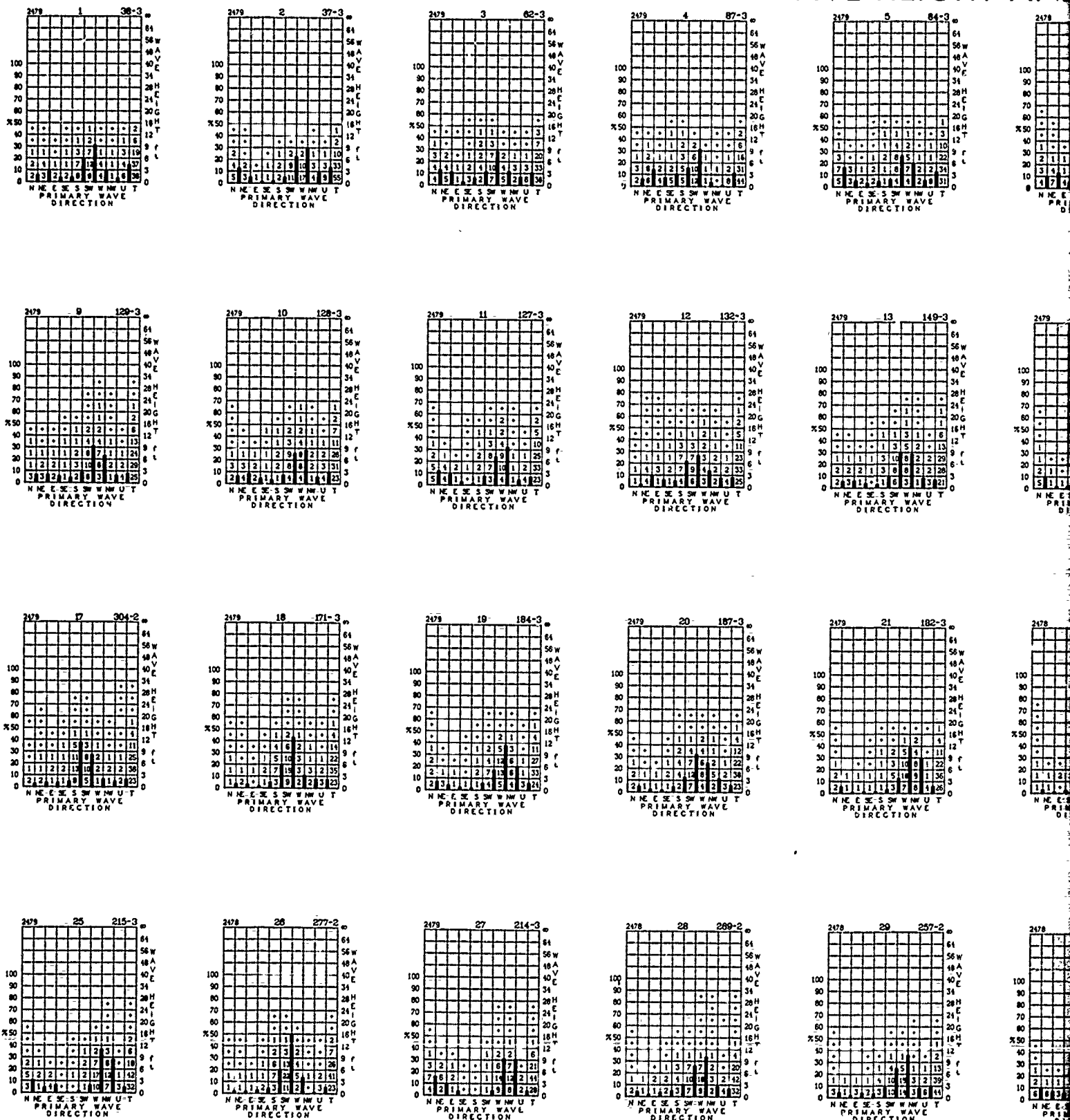
JUNE



2

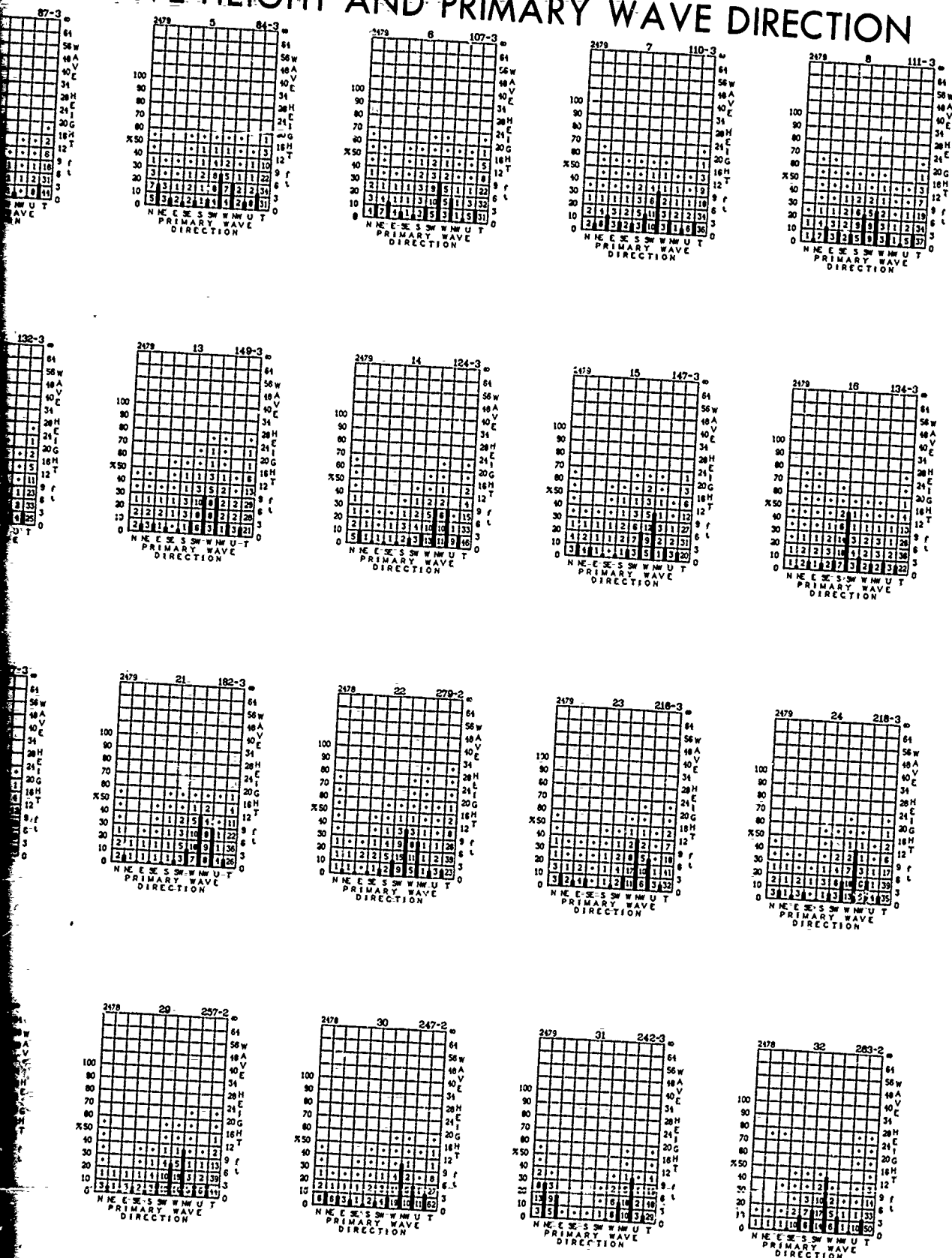
# JULY

# WAVE HEIGHT AND

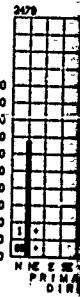
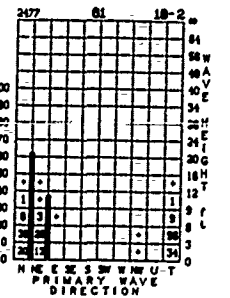
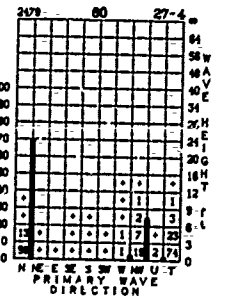
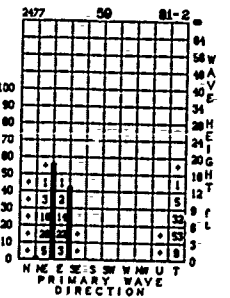
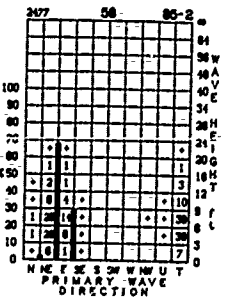
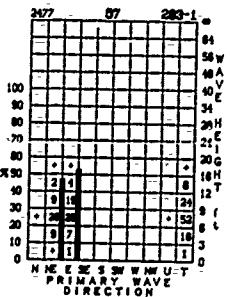
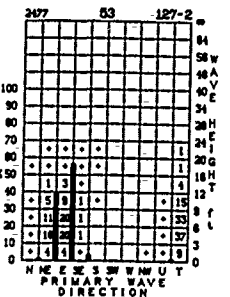
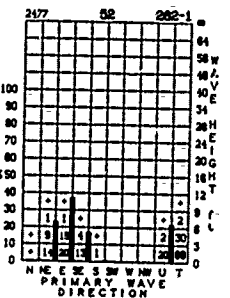
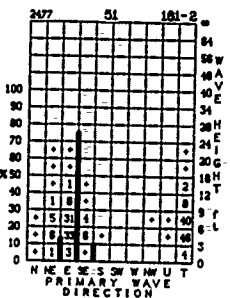
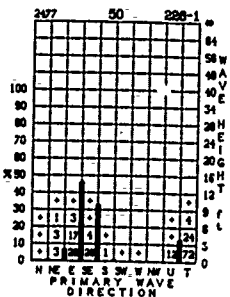
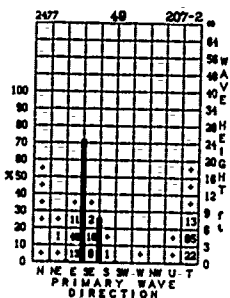
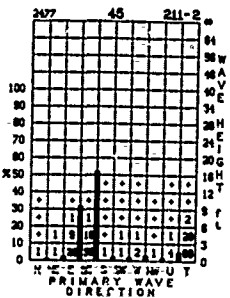
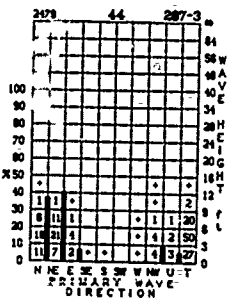
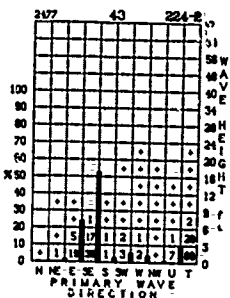
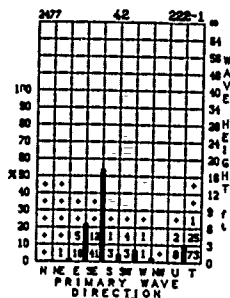
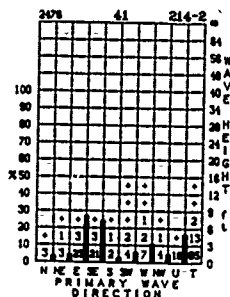
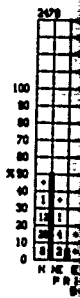
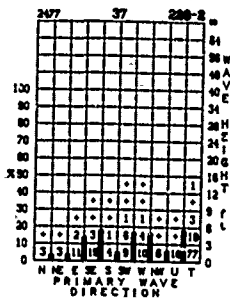
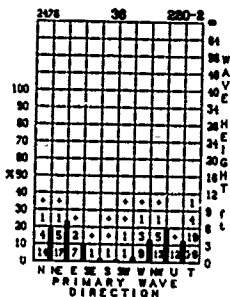
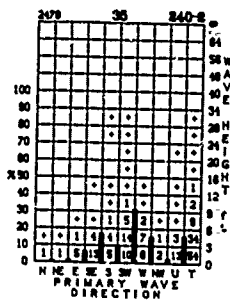
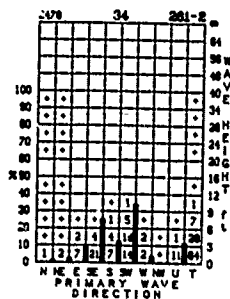
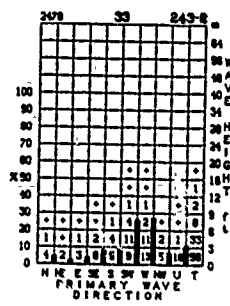




# WAVE HEIGHT AND PRIMARY WAVE DIRECTION

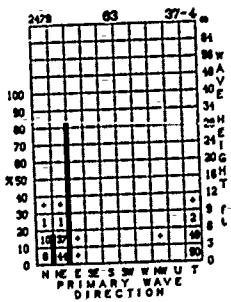
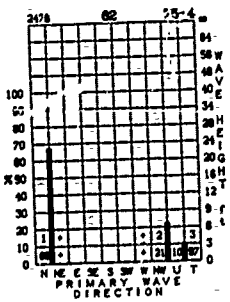
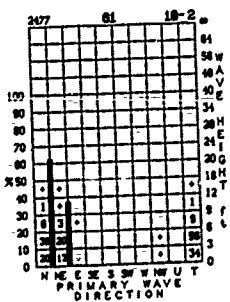
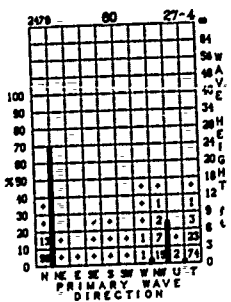
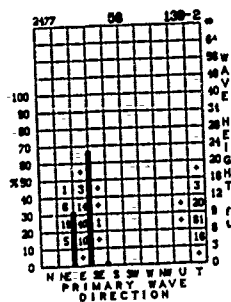
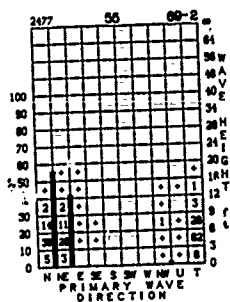
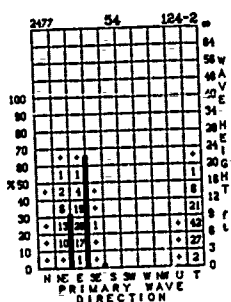
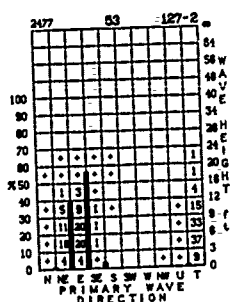
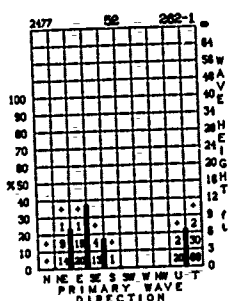
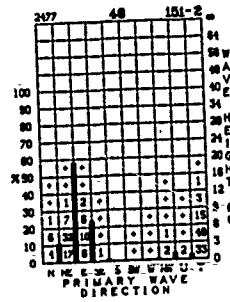
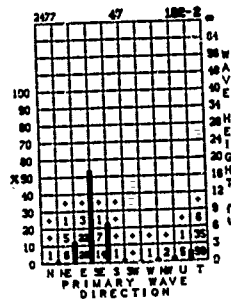
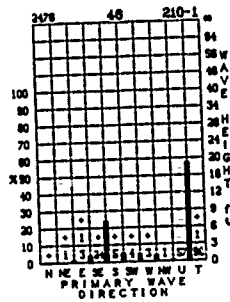
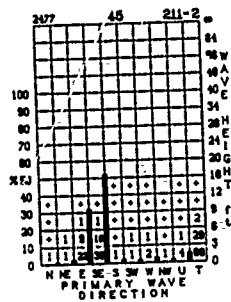
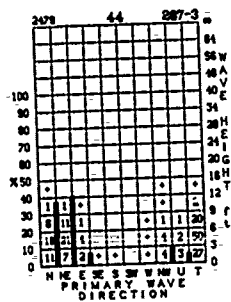
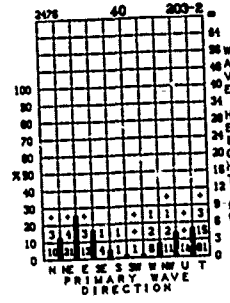
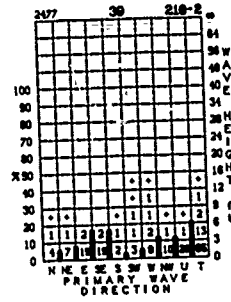
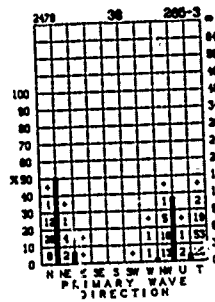
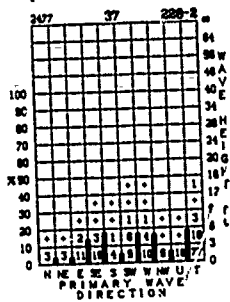
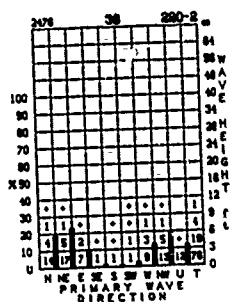


# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)



# WAVE DIRECTION (Cont'd)

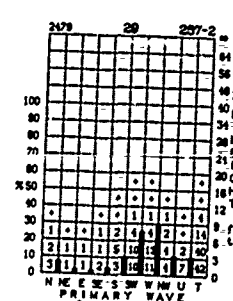
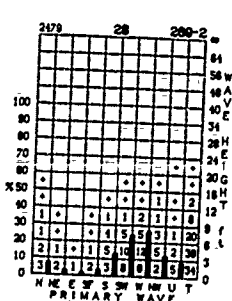
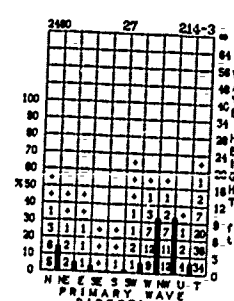
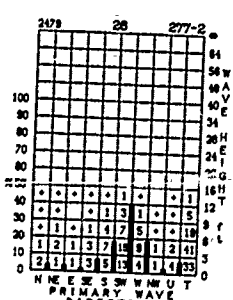
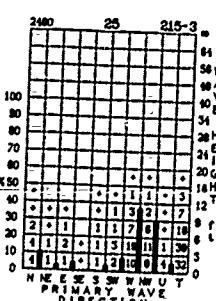
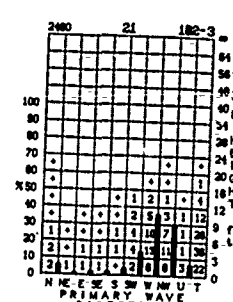
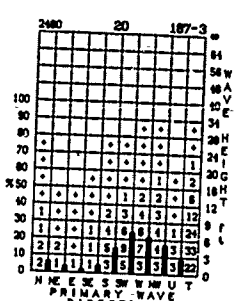
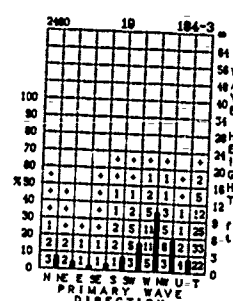
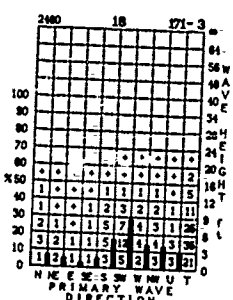
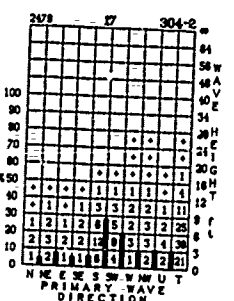
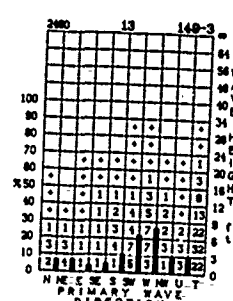
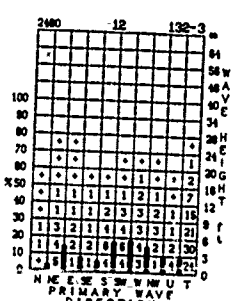
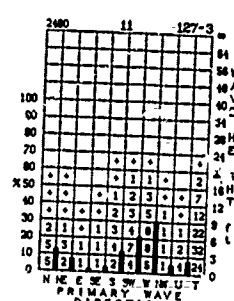
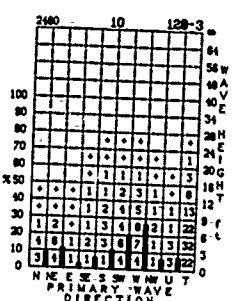
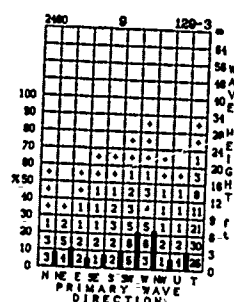
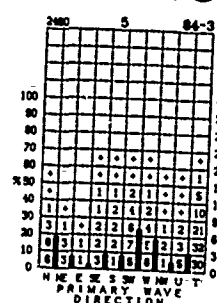
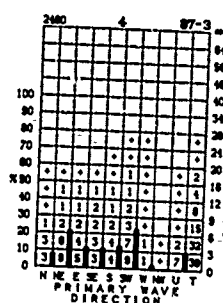
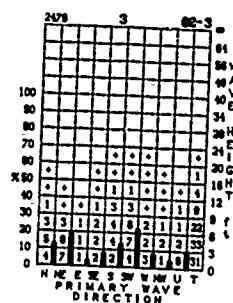
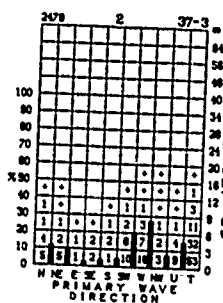
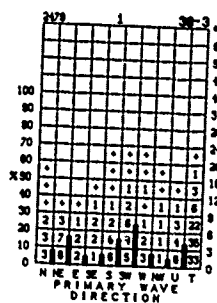
JULY



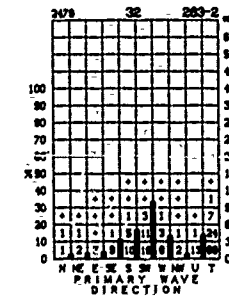
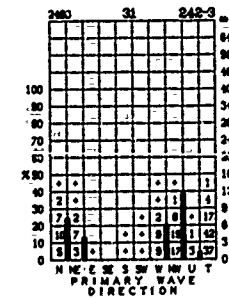
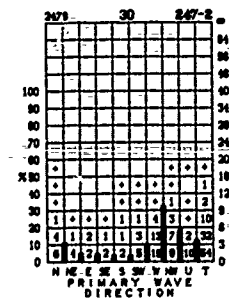
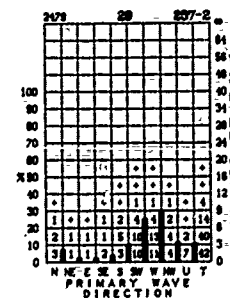
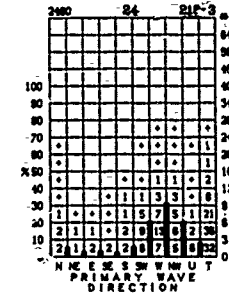
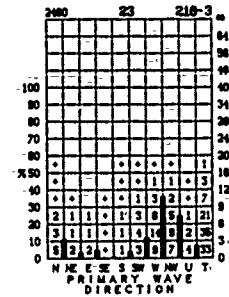
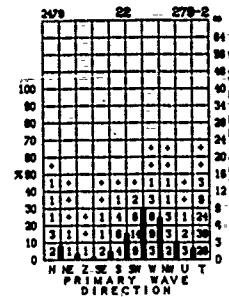
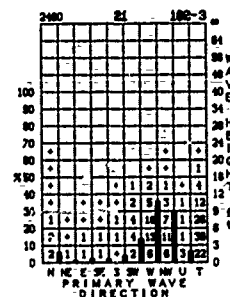
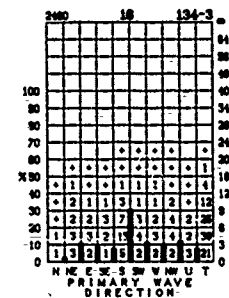
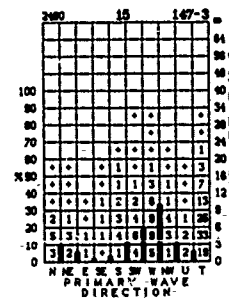
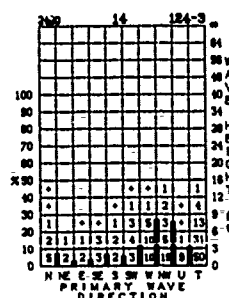
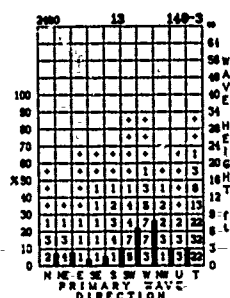
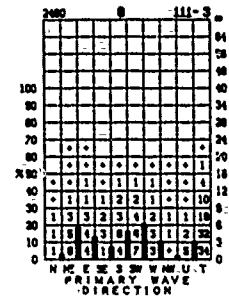
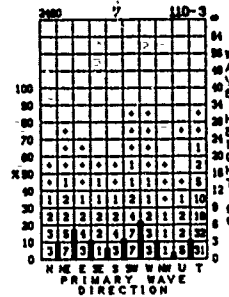
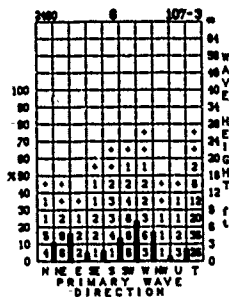
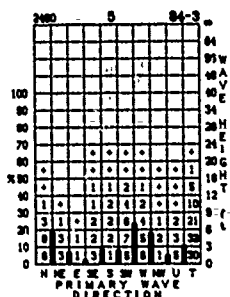
2

# AUGUST

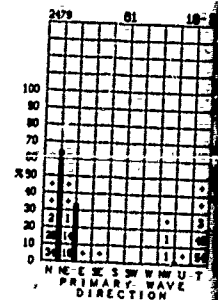
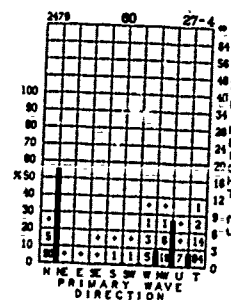
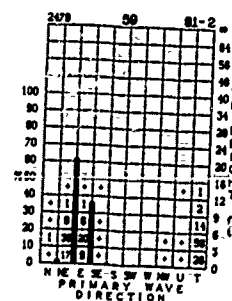
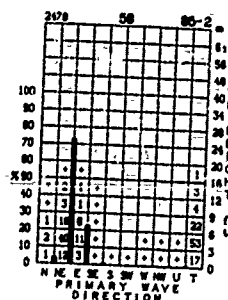
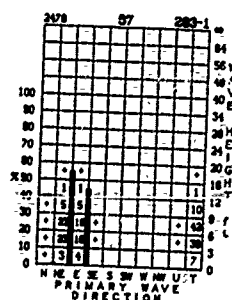
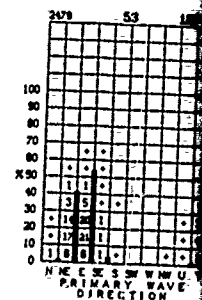
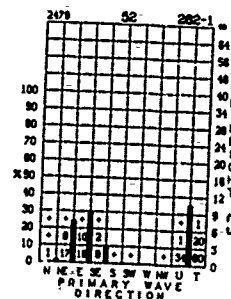
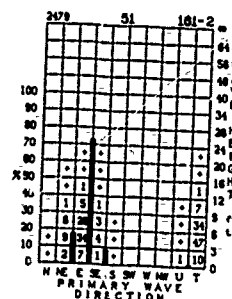
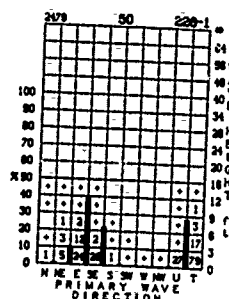
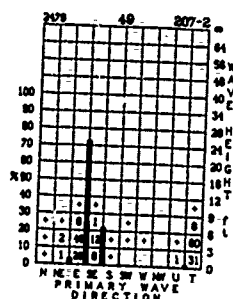
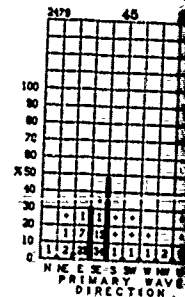
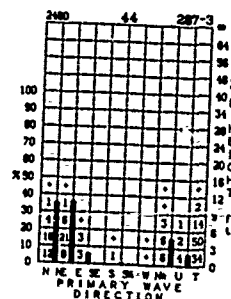
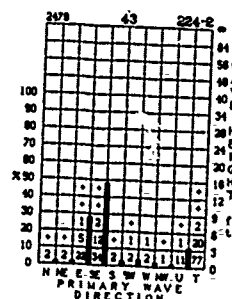
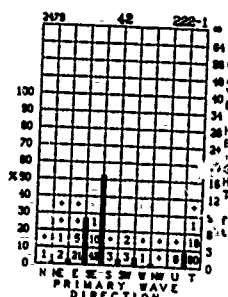
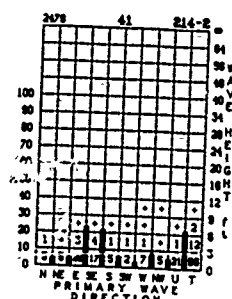
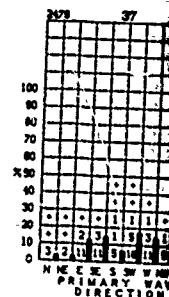
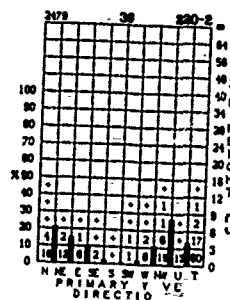
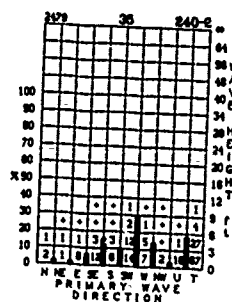
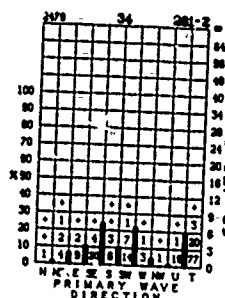
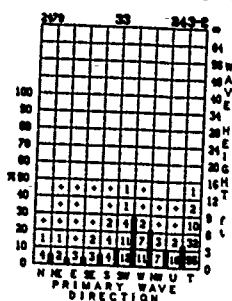
# WAVE HEIGHT AND



# WAVE HEIGHT AND PRIMARY WAVE DIRECTION



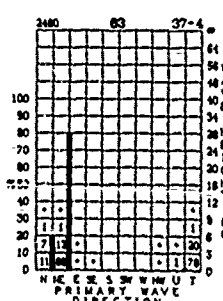
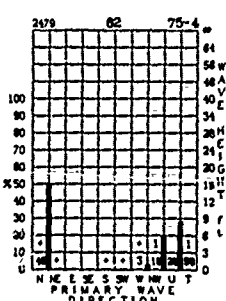
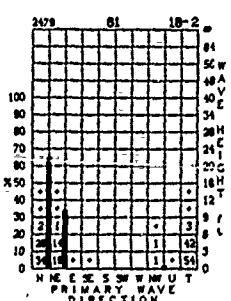
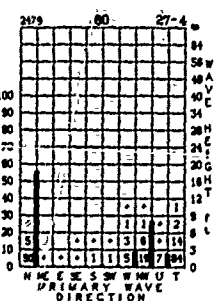
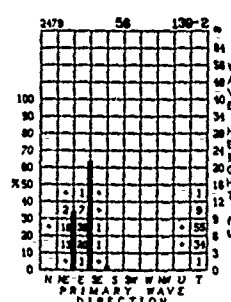
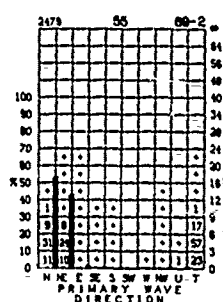
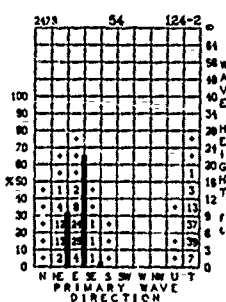
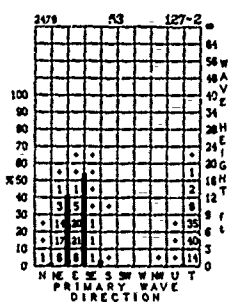
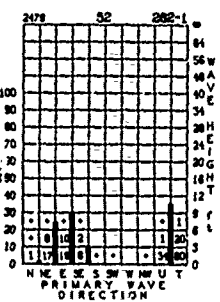
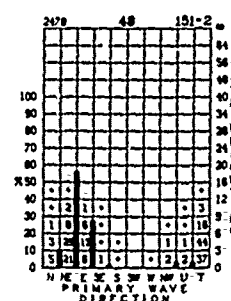
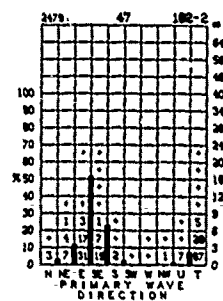
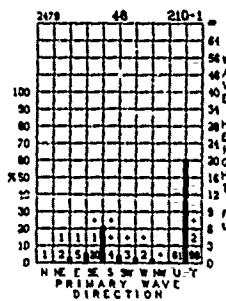
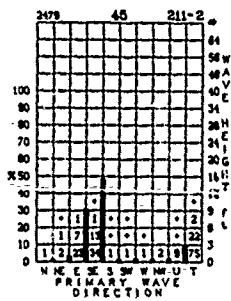
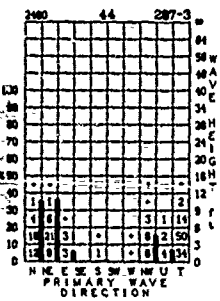
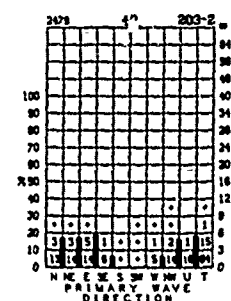
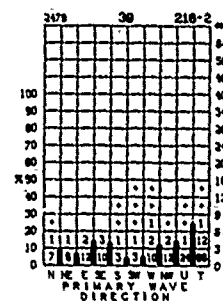
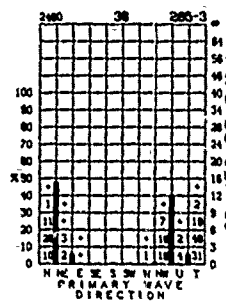
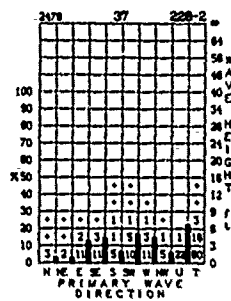
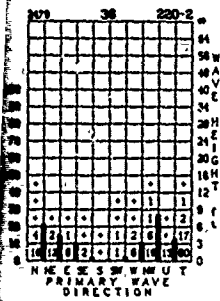
# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont)



1

# DIRECTION (Cont'd)

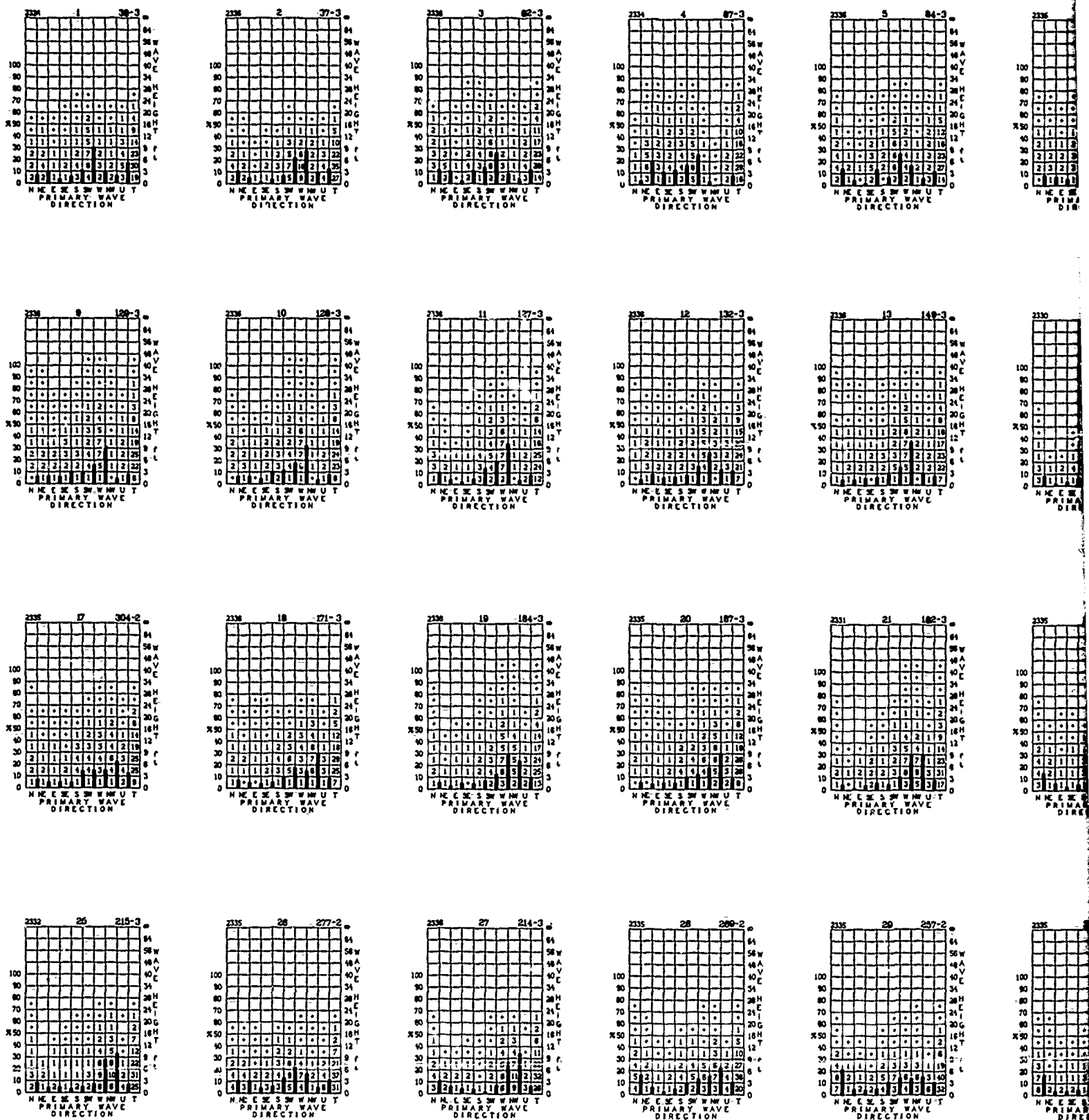
AUGUST



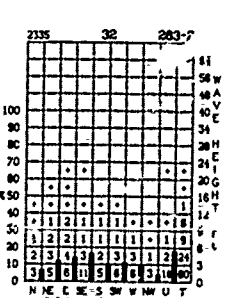
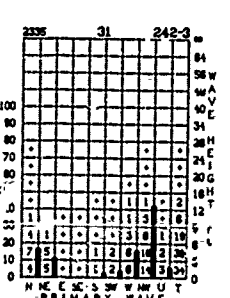
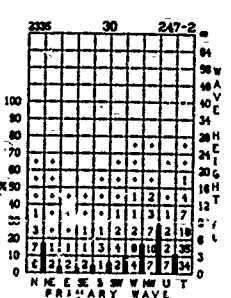
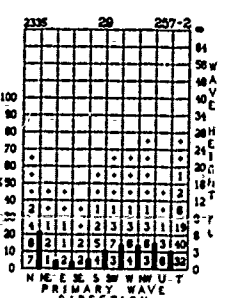
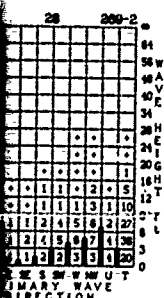
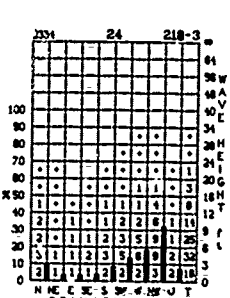
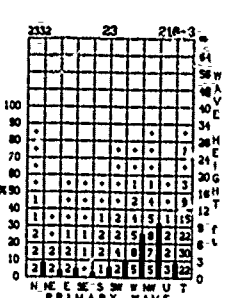
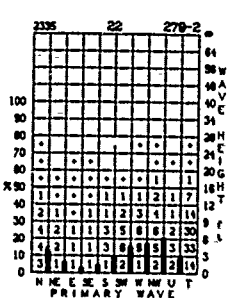
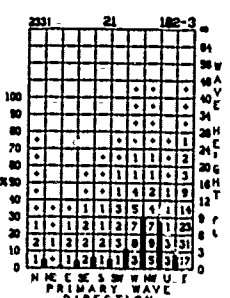
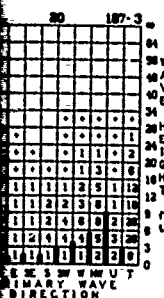
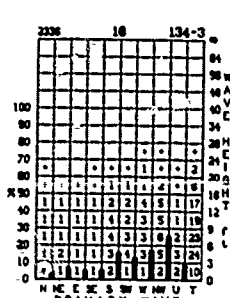
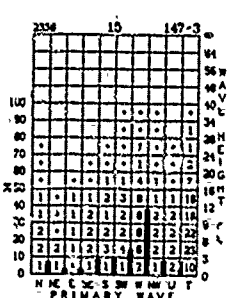
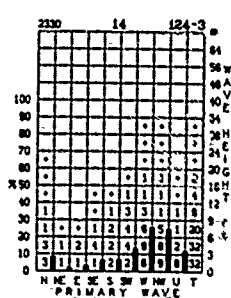
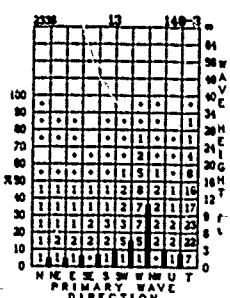
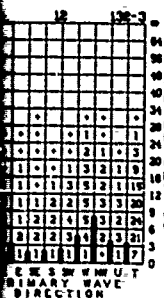
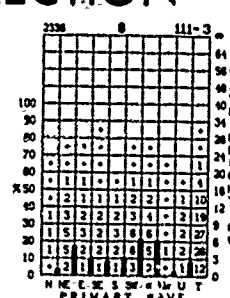
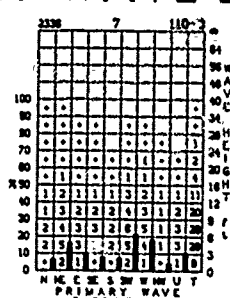
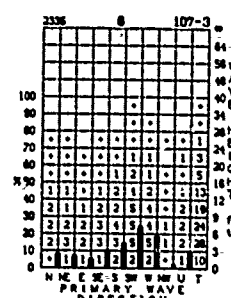
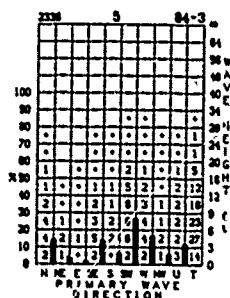
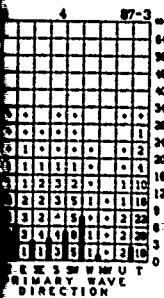


# SEPTEMBER

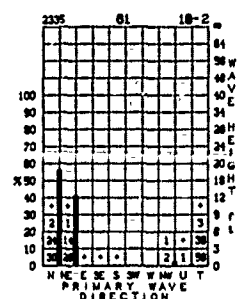
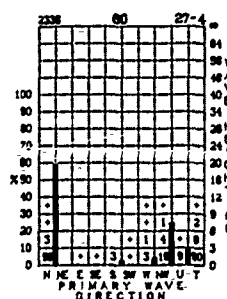
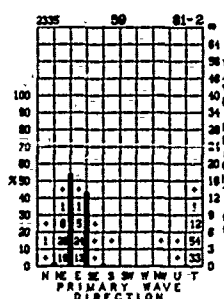
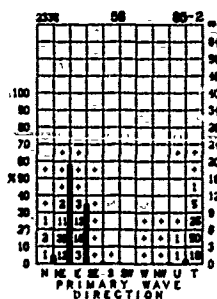
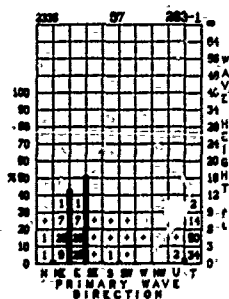
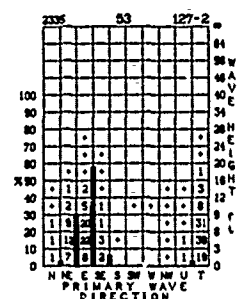
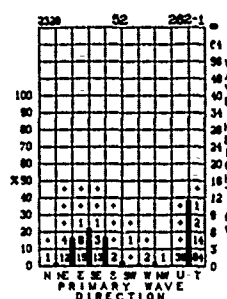
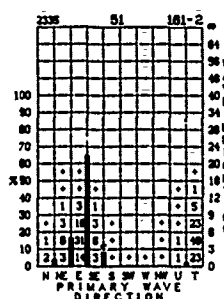
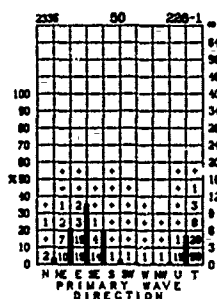
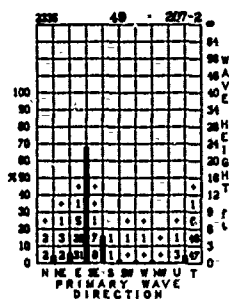
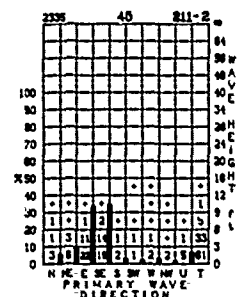
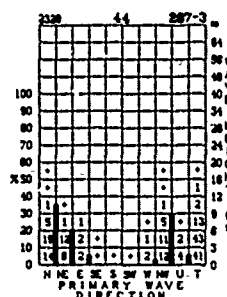
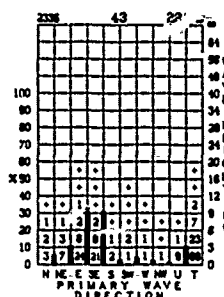
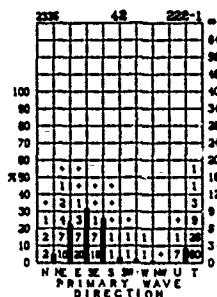
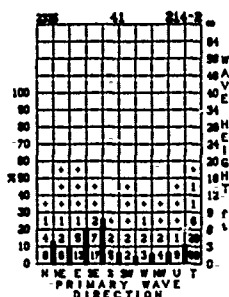
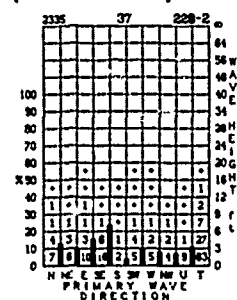
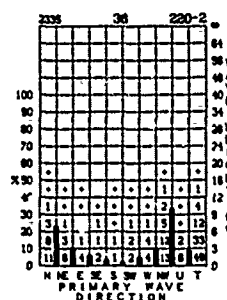
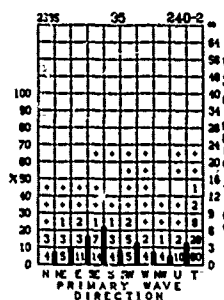
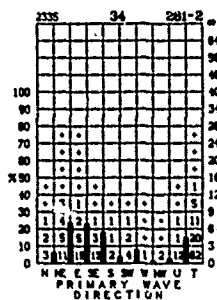
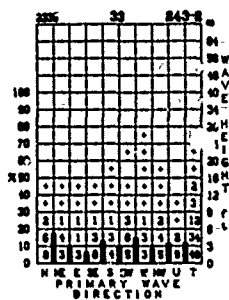
# WAVE HEIGHT AND



# WAVE HEIGHT AND PRIMARY WAVE DIRECTION

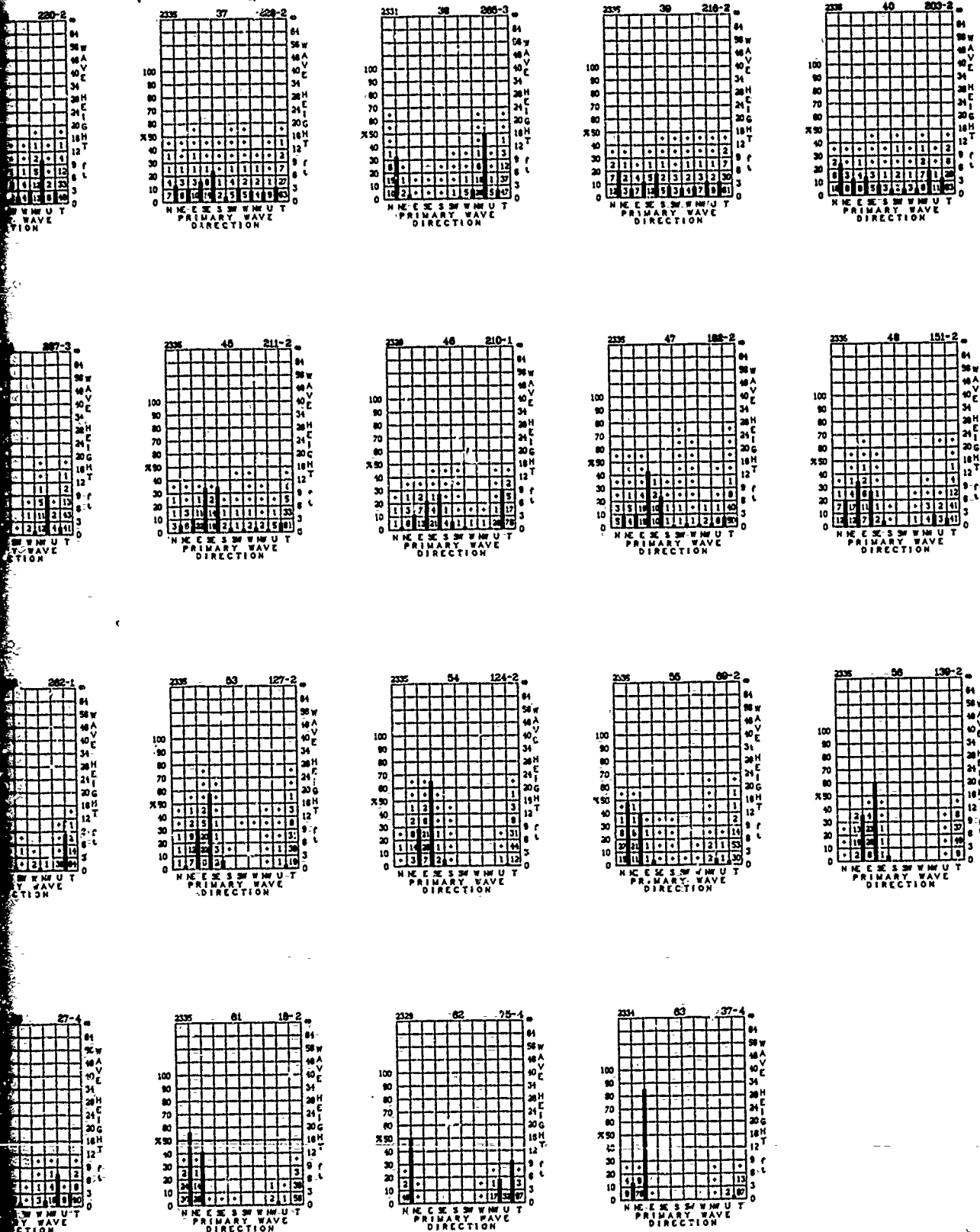


# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)



# CTION (Cont'd)

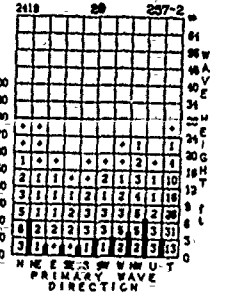
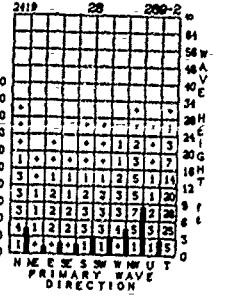
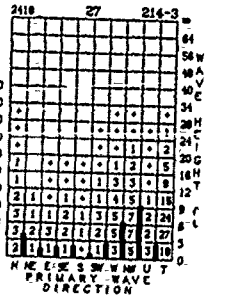
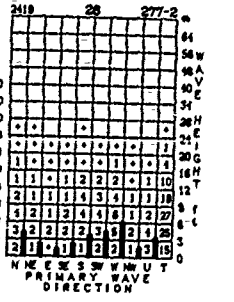
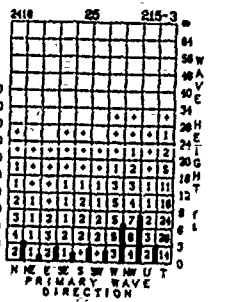
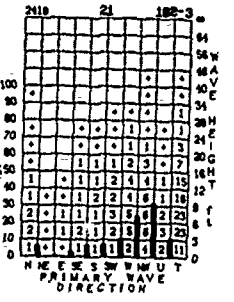
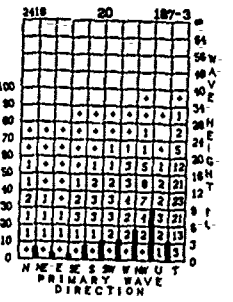
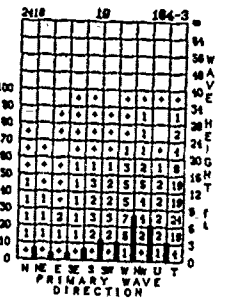
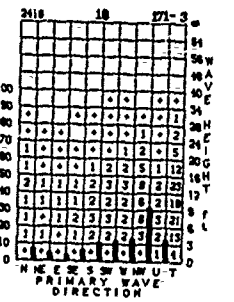
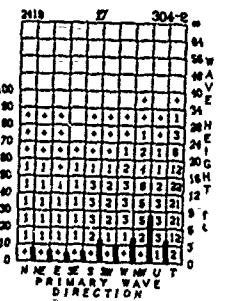
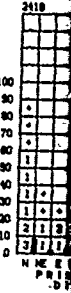
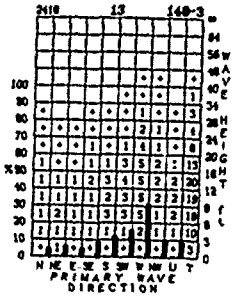
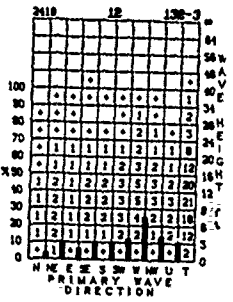
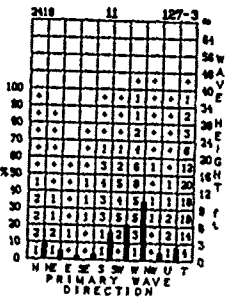
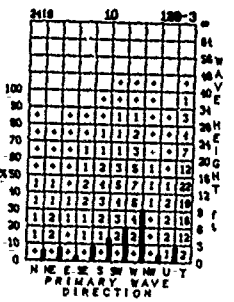
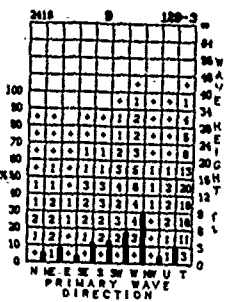
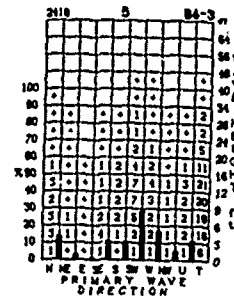
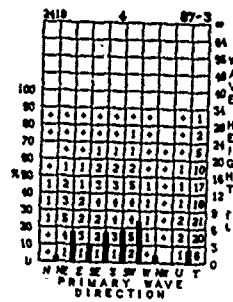
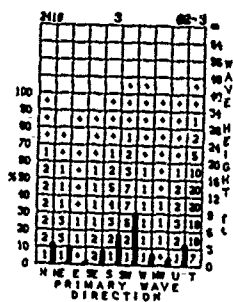
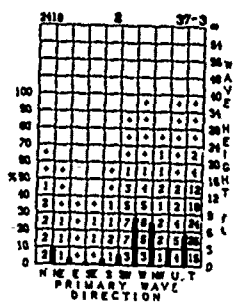
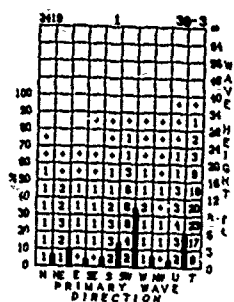
# SEPTEMBER



2

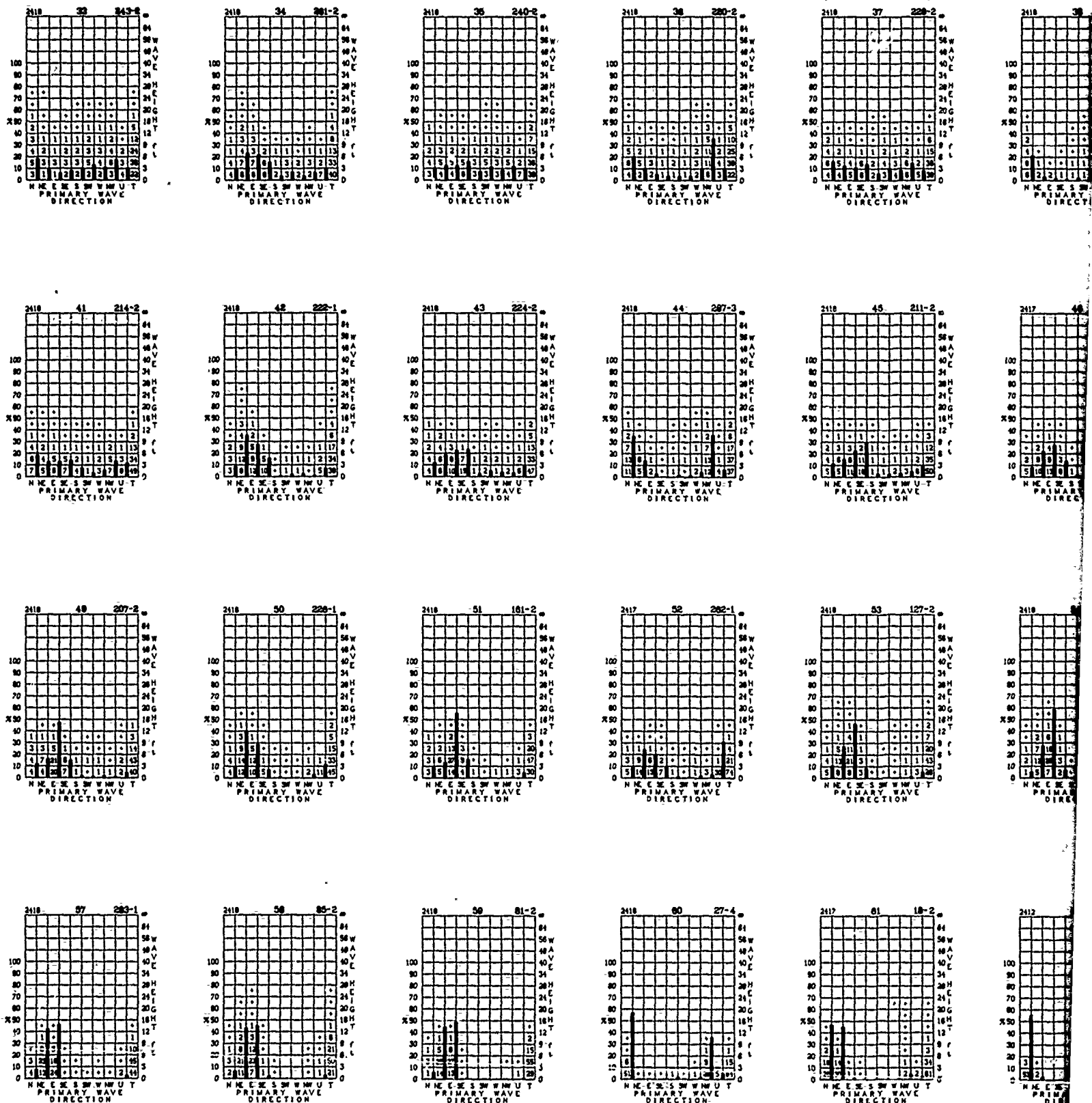
# OCTOBER

# WAVE HEIGHT AND





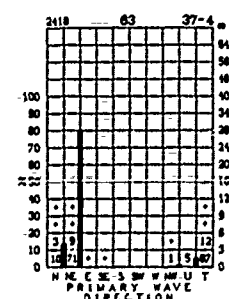
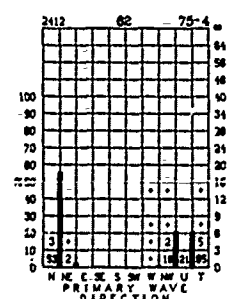
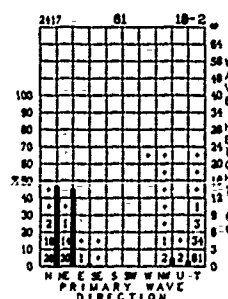
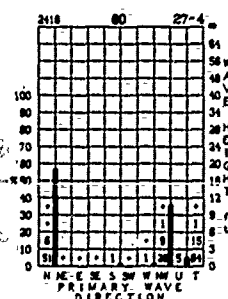
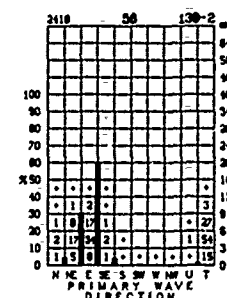
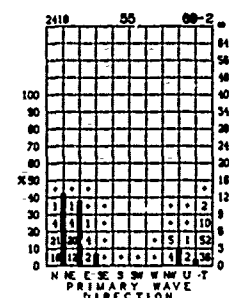
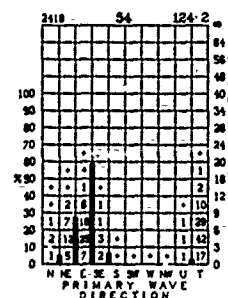
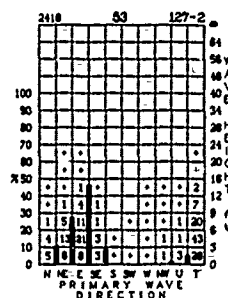
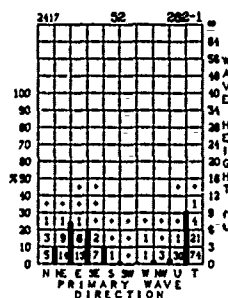
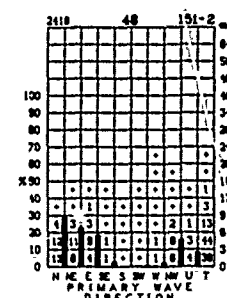
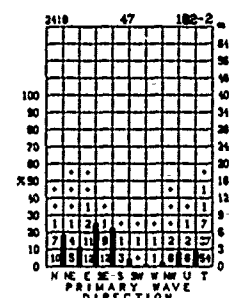
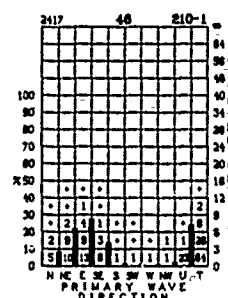
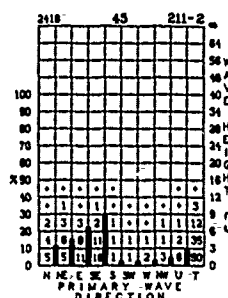
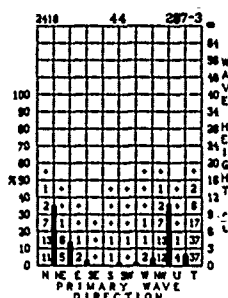
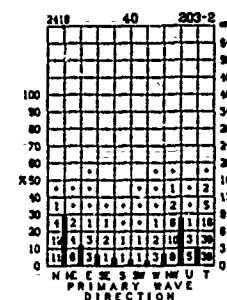
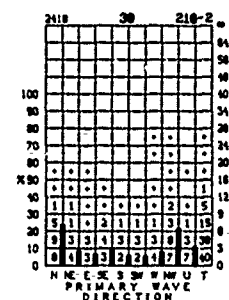
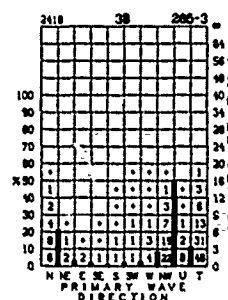
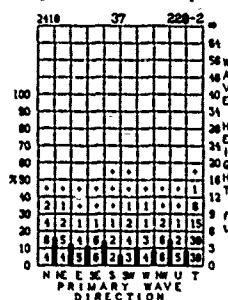
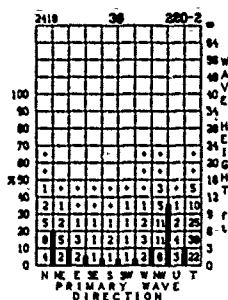
# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)





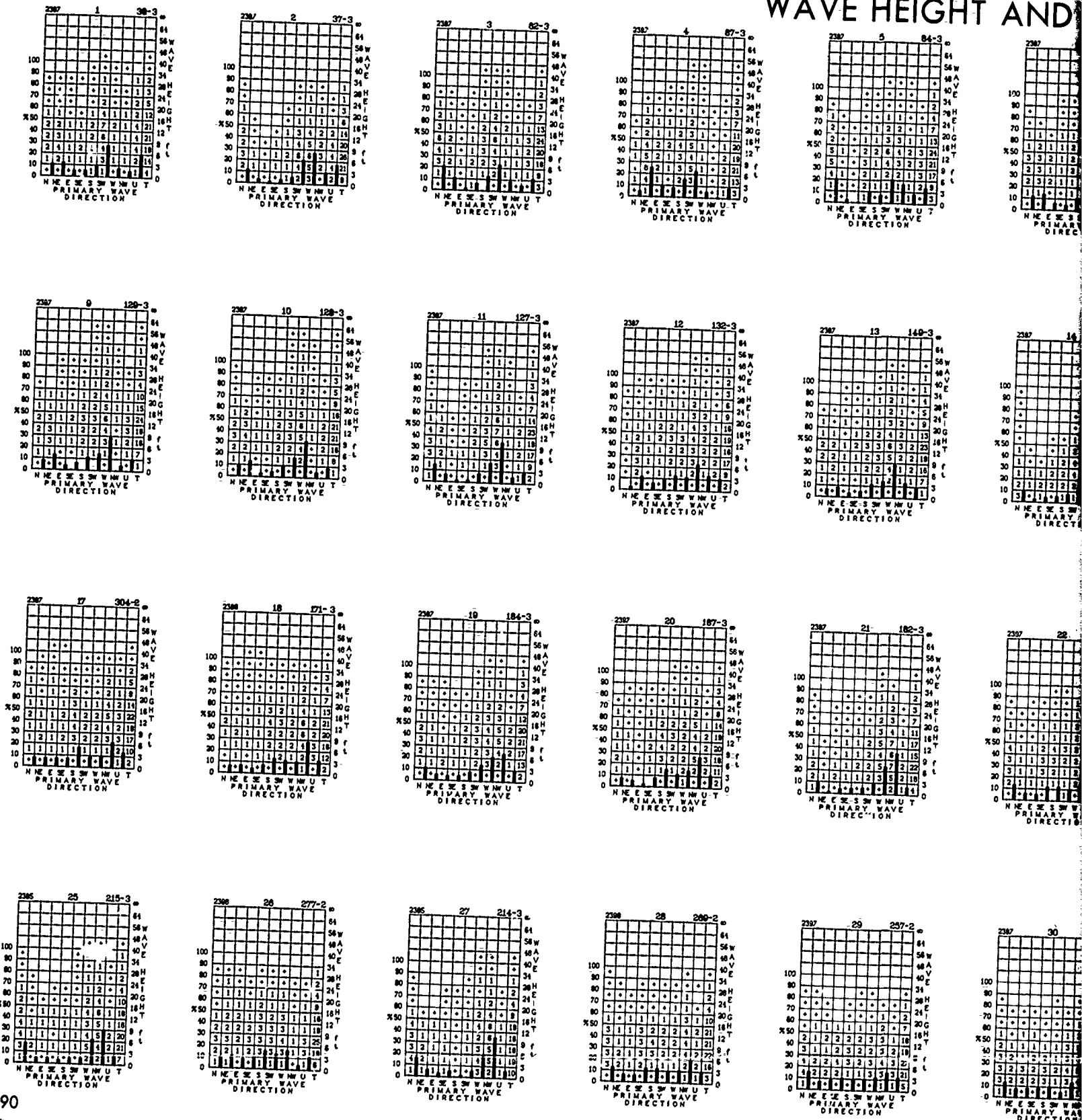
# VE DIRECTION (Cont'd)

## OCTOBER



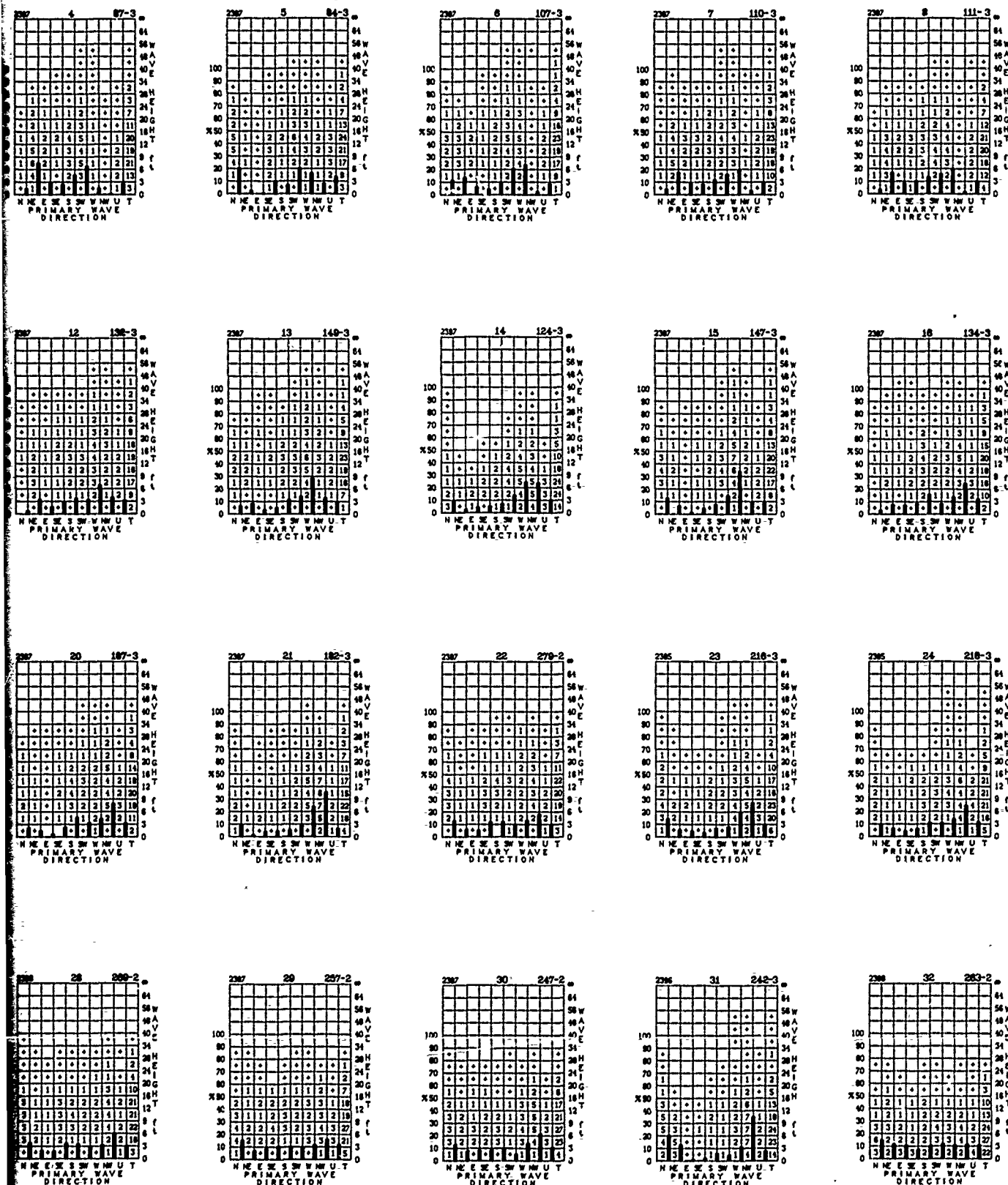
# NOVEMBER

# WAVE HEIGHT AND

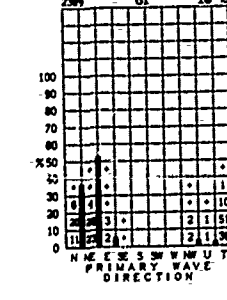
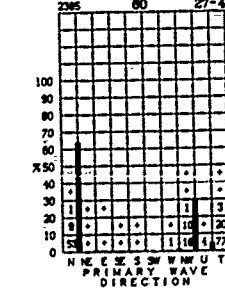
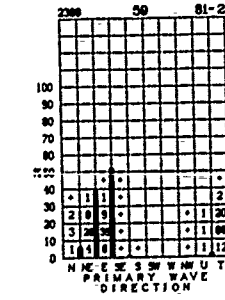
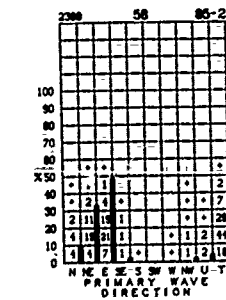
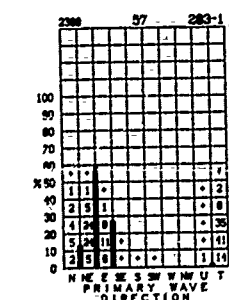
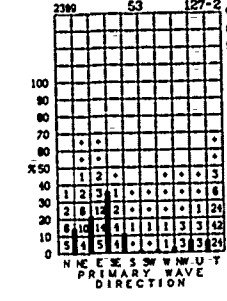
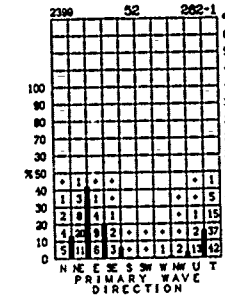
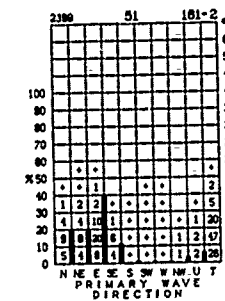
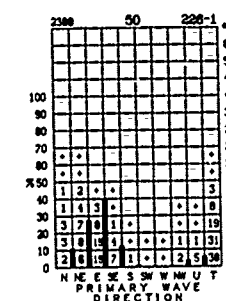
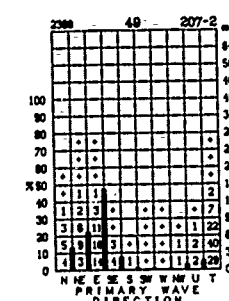
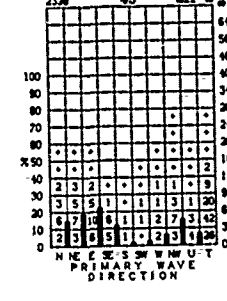
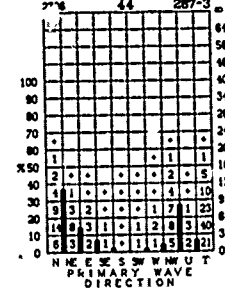
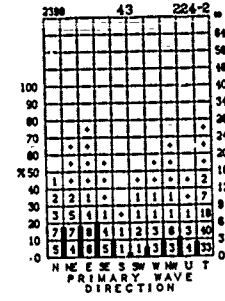
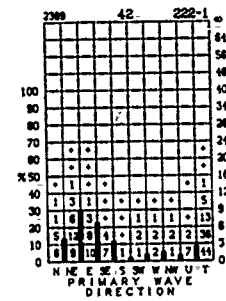
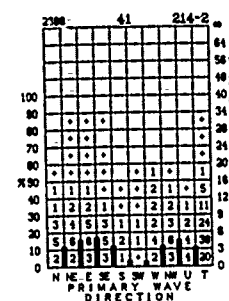
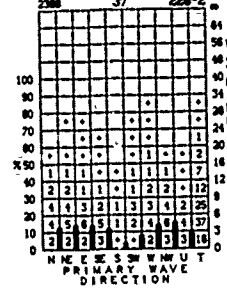
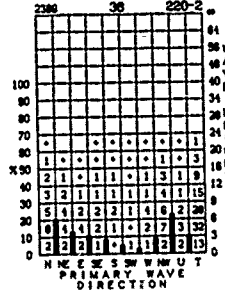
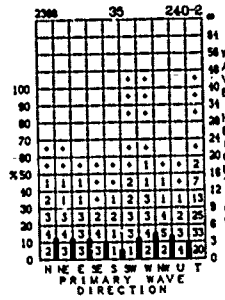
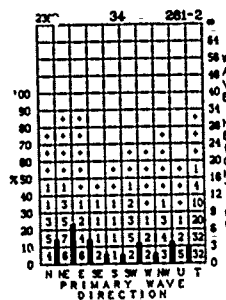
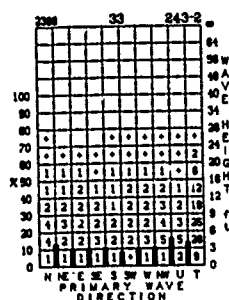


①

# WAVE HEIGHT AND PRIMARY WAVE DIRECTION



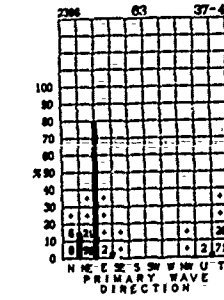
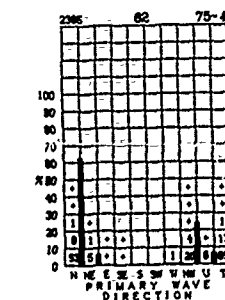
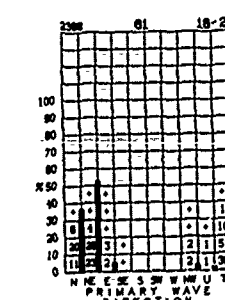
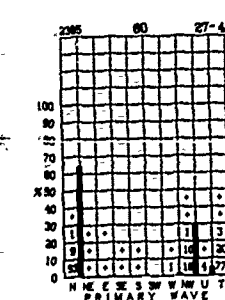
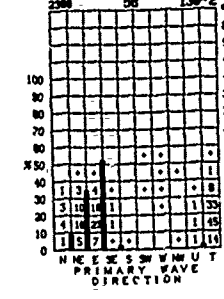
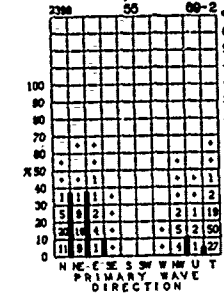
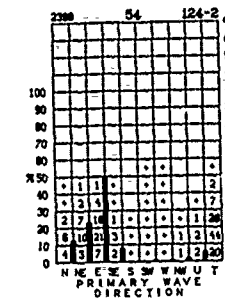
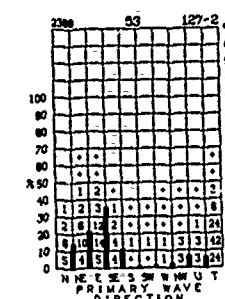
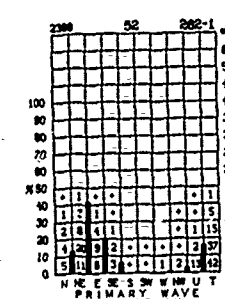
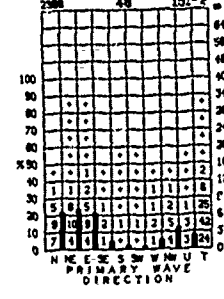
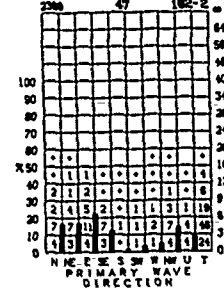
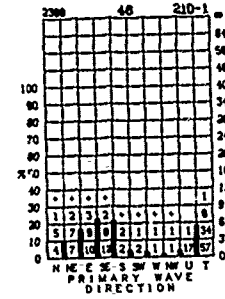
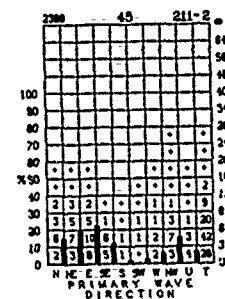
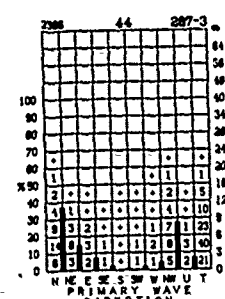
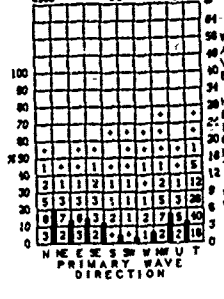
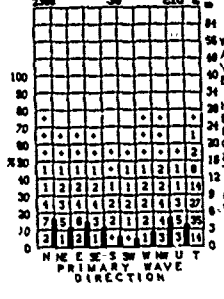
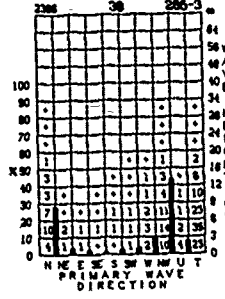
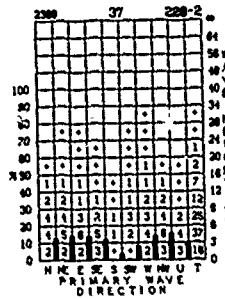
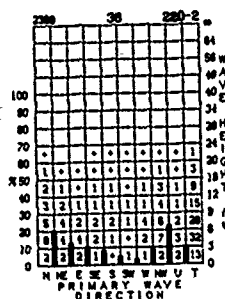
# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)



1

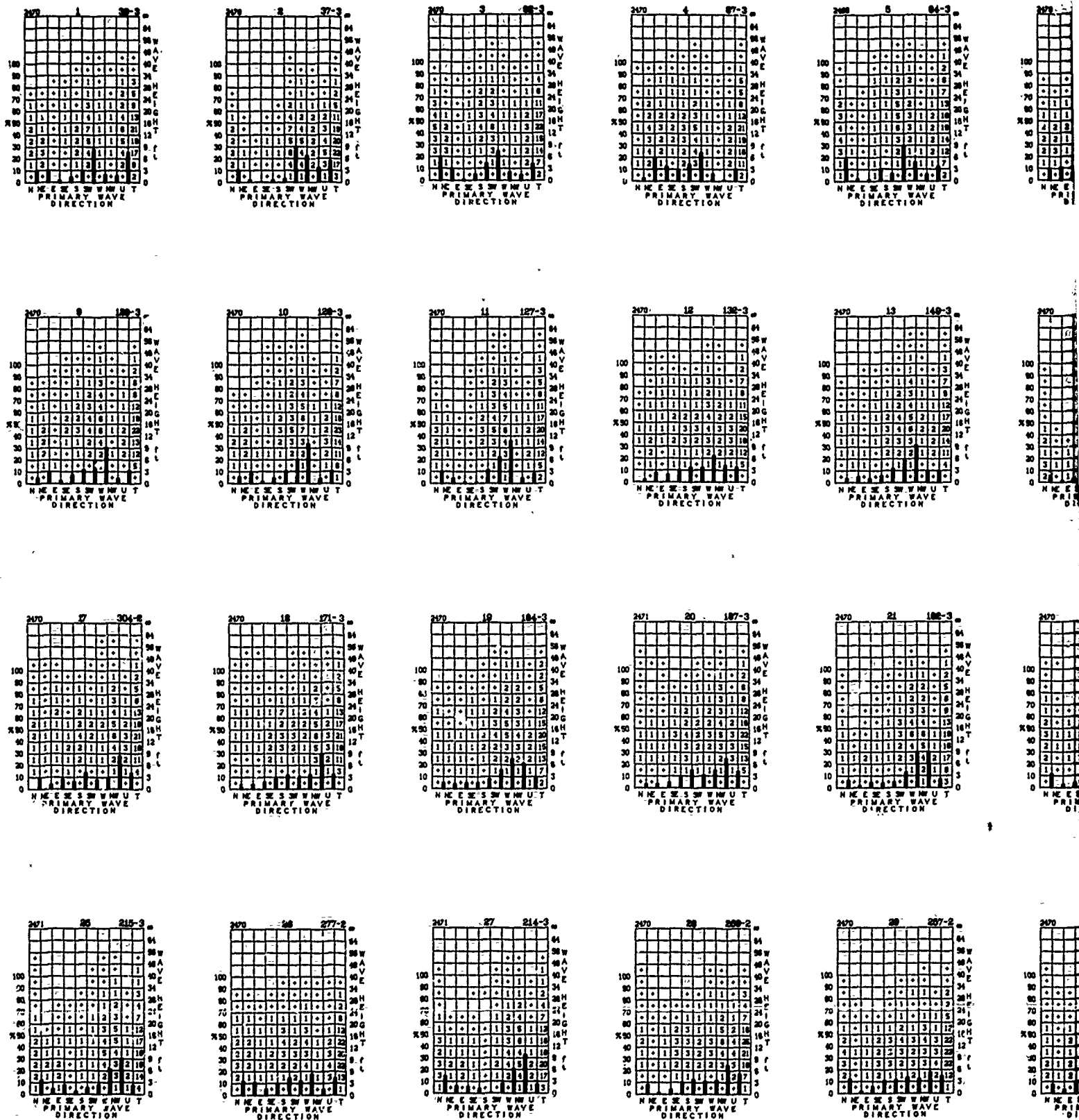
# VE DIRECTION (Cont'd)

## NOVEMBER

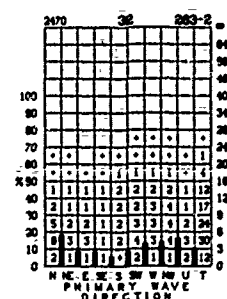
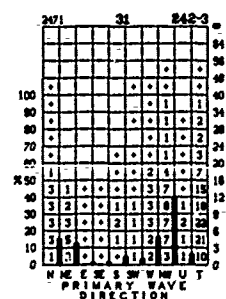
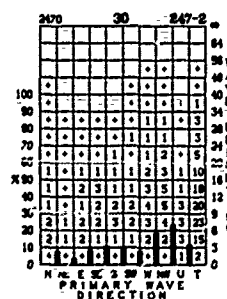
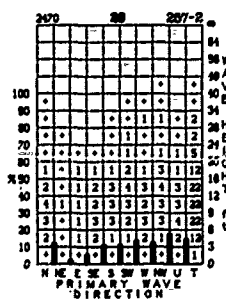
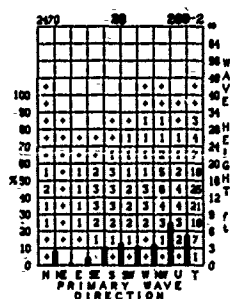
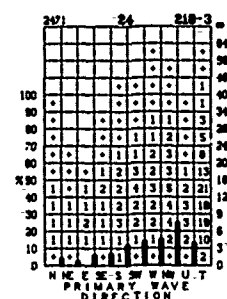
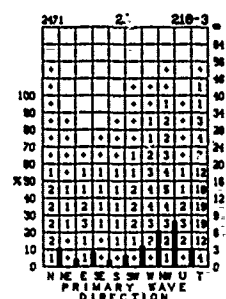
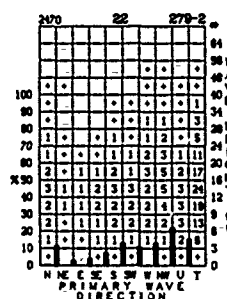
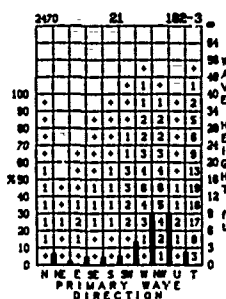
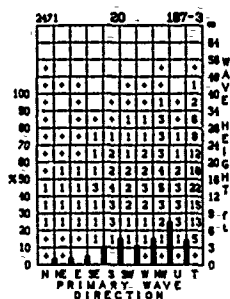
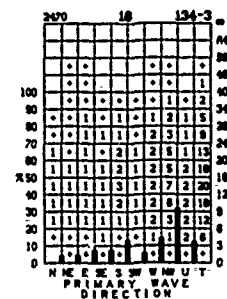
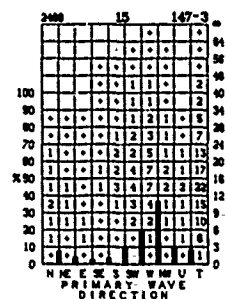
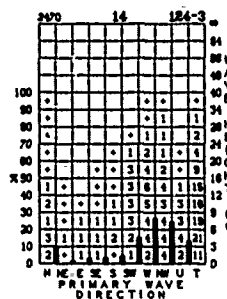
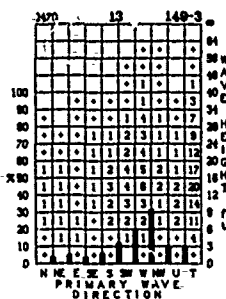
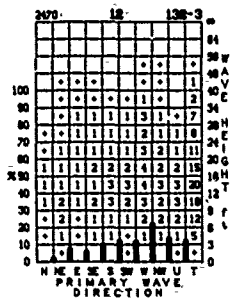
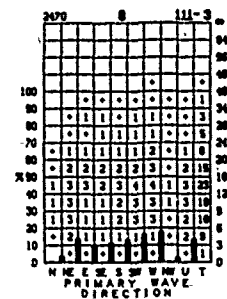
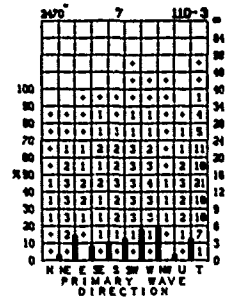
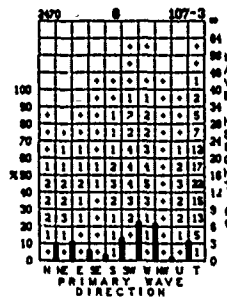
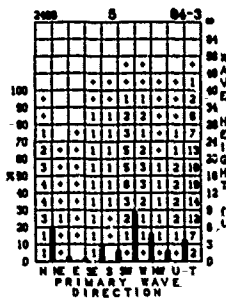
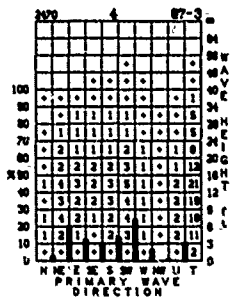


# DECEMBER

# WAVE HEIGHT AND

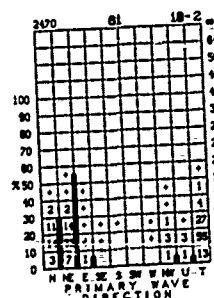
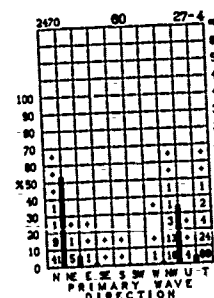
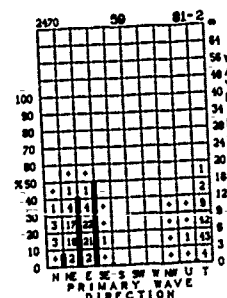
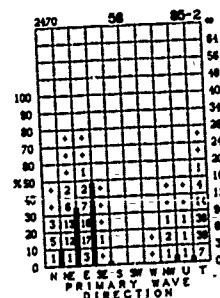
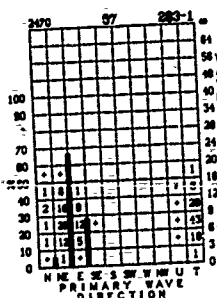
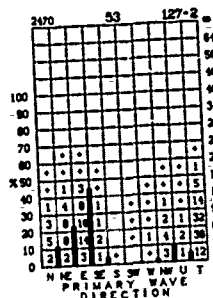
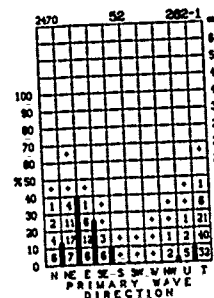
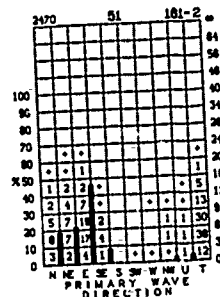
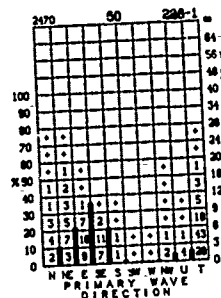
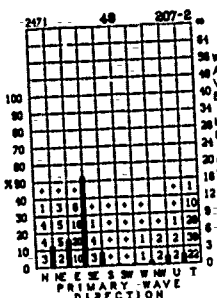
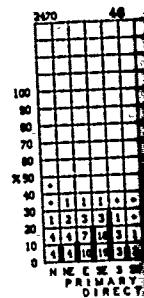
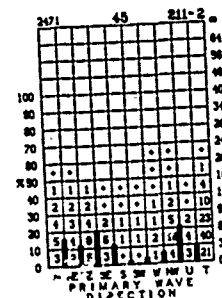
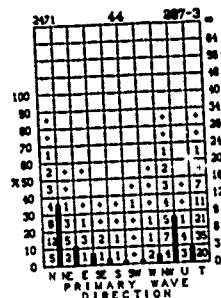
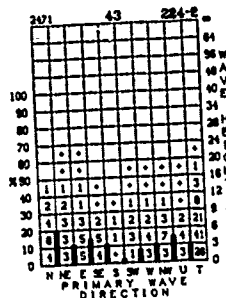
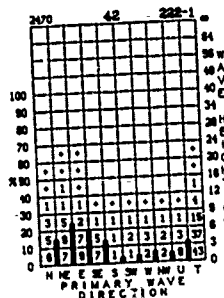
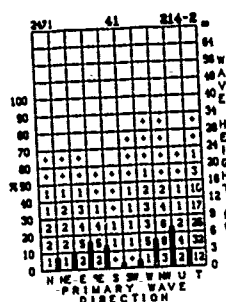
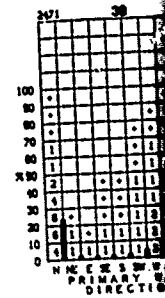
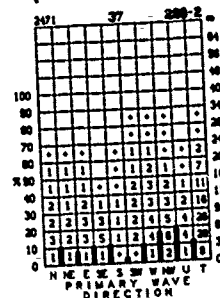
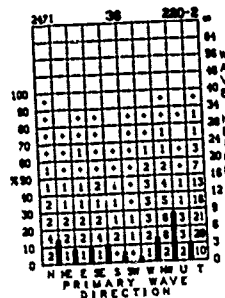
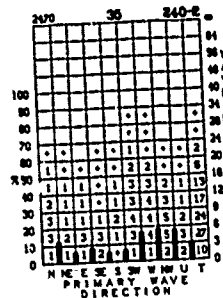
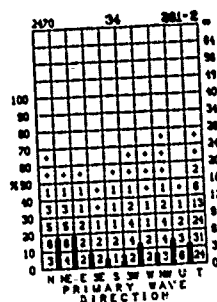
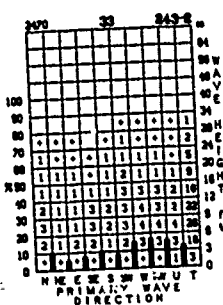


# WAVE HEIGHT AND PRIMARY WAVE DIRECTION





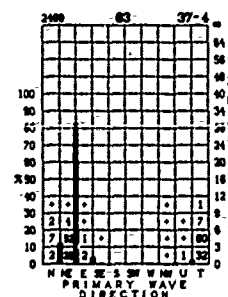
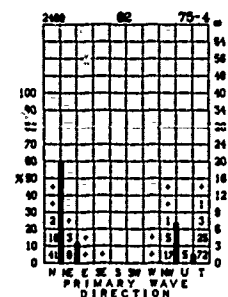
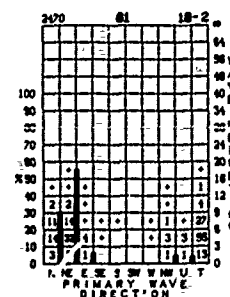
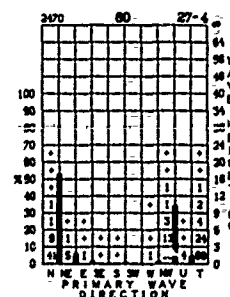
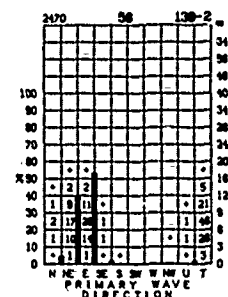
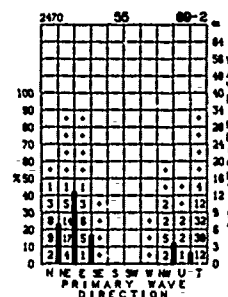
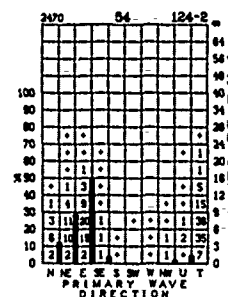
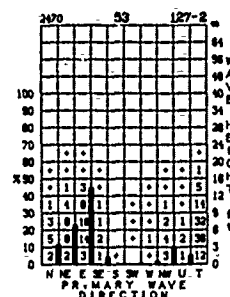
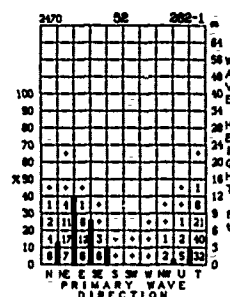
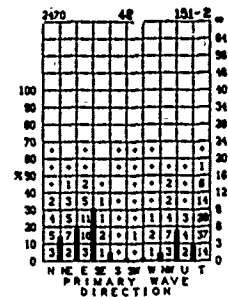
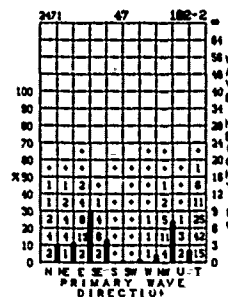
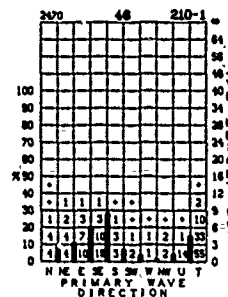
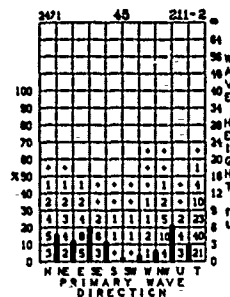
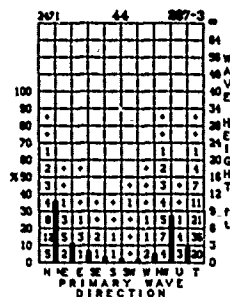
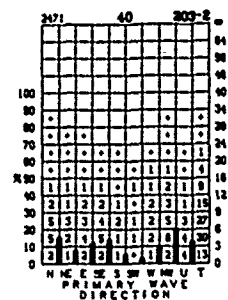
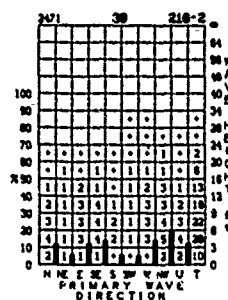
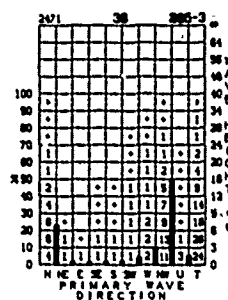
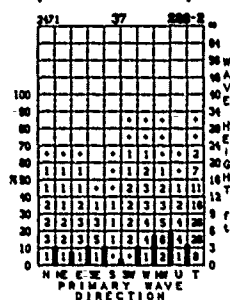
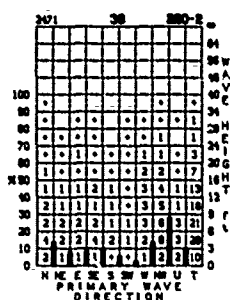
# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)



①

# AVE DIRECTION (Cont'd)

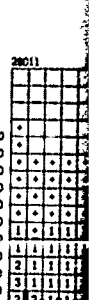
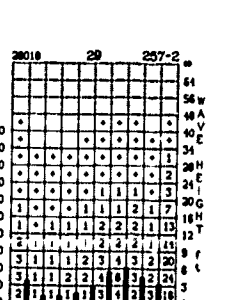
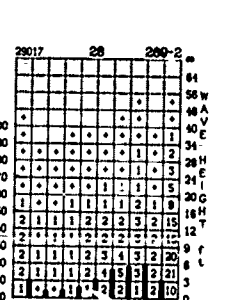
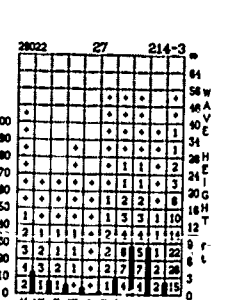
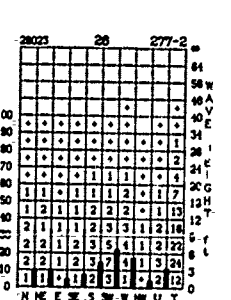
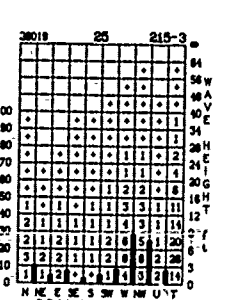
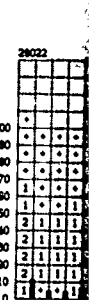
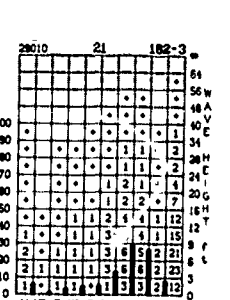
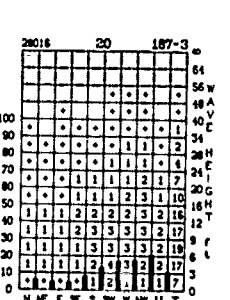
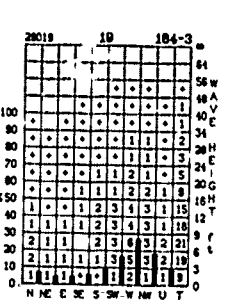
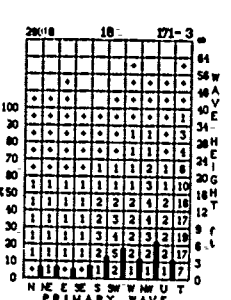
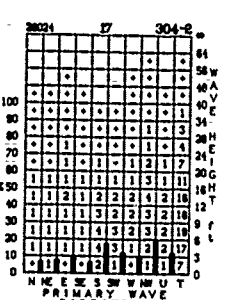
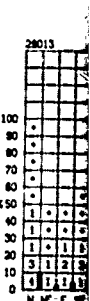
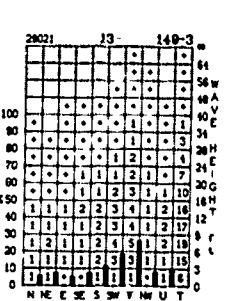
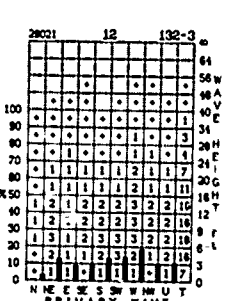
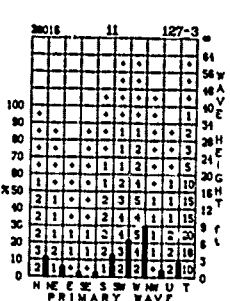
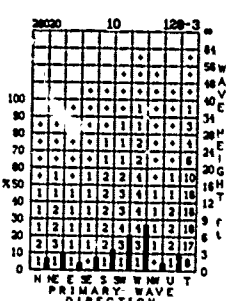
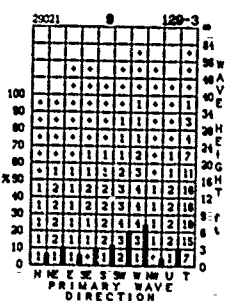
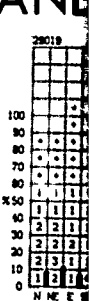
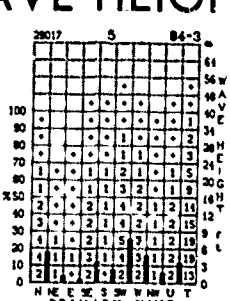
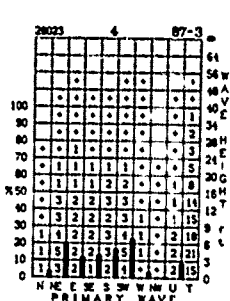
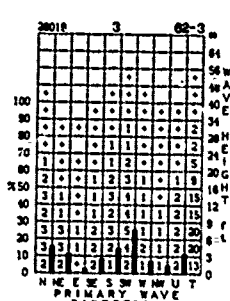
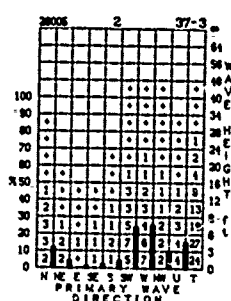
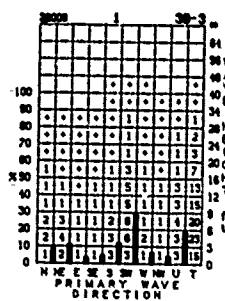
# DECEMBER



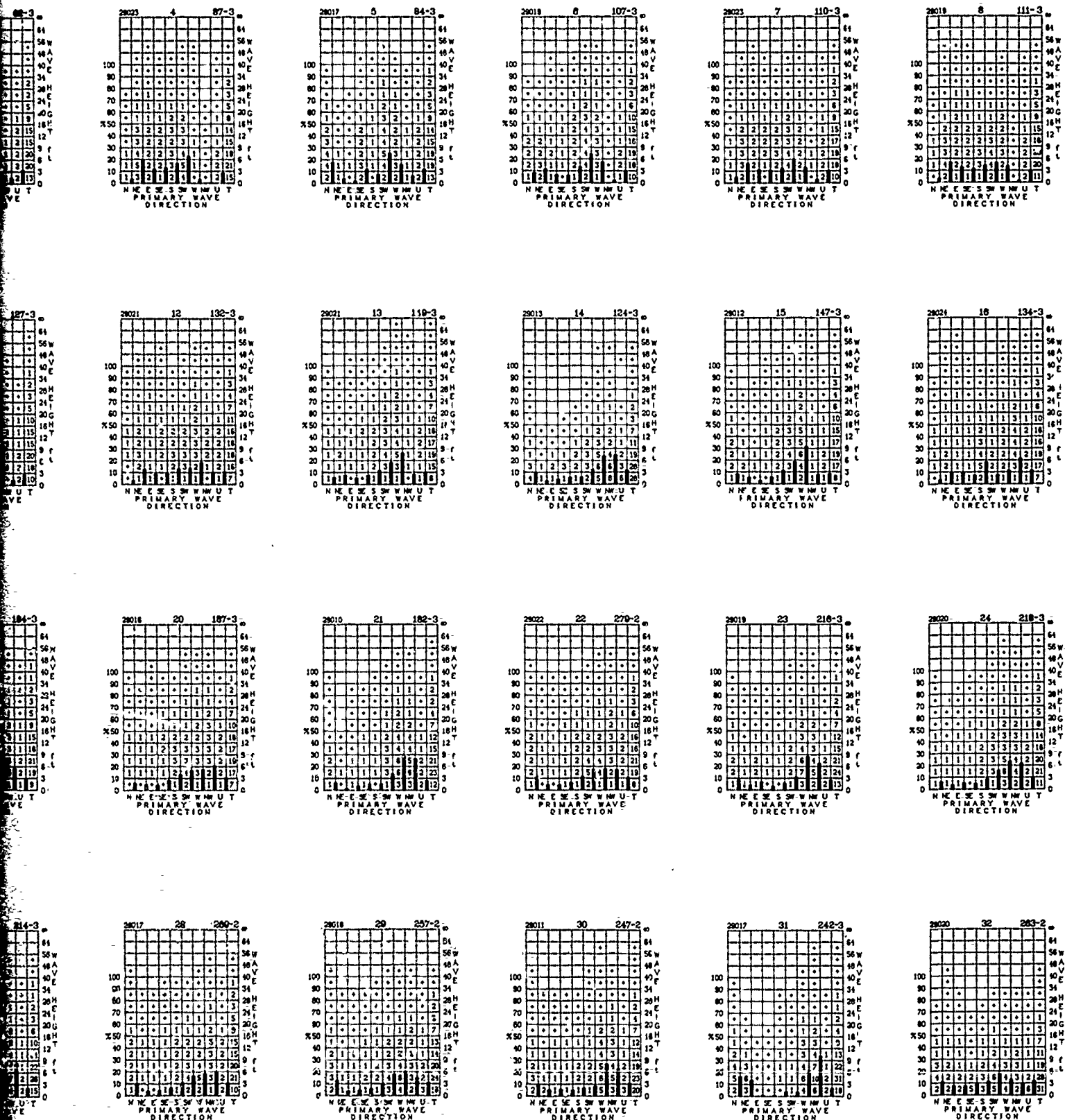
2

# ANNUAL

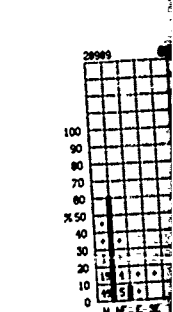
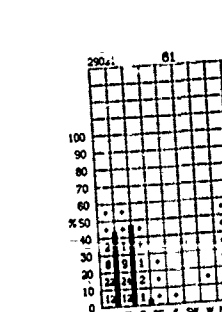
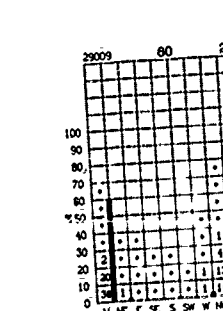
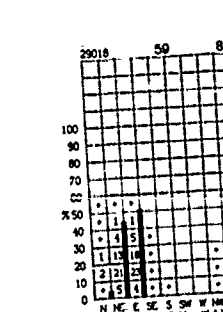
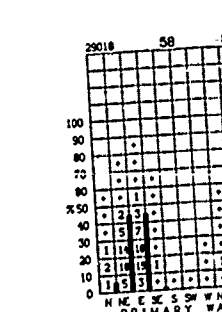
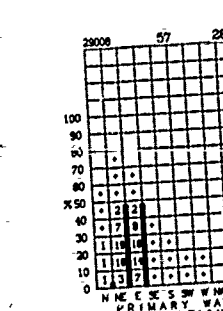
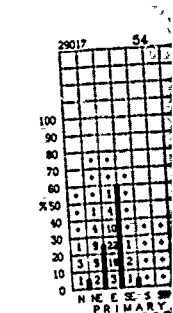
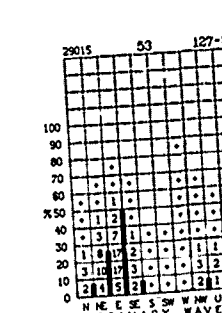
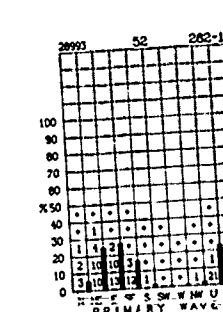
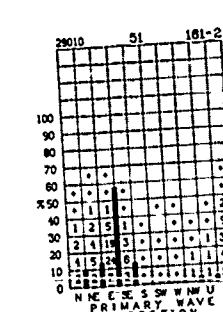
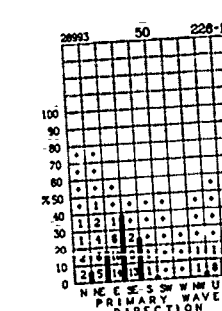
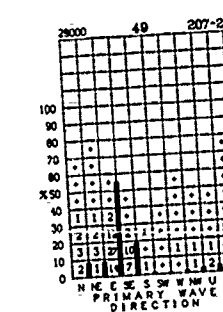
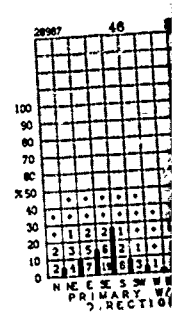
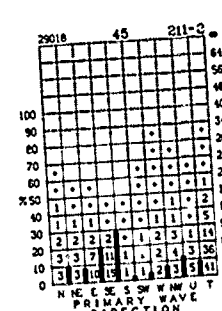
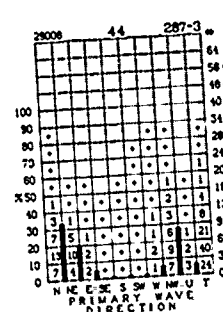
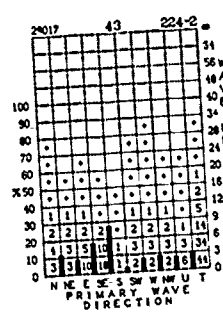
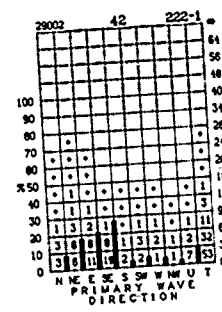
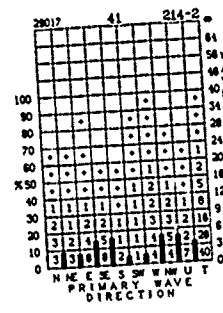
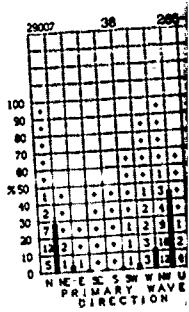
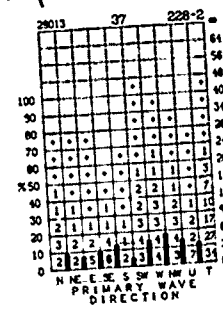
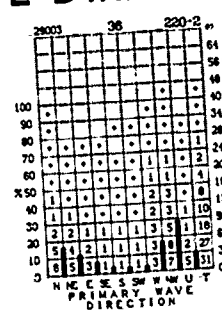
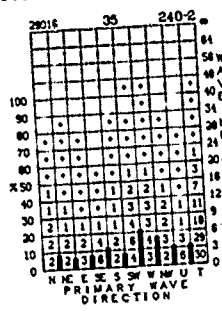
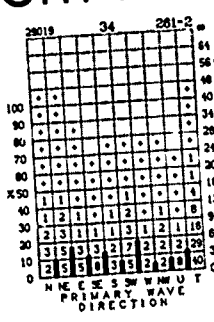
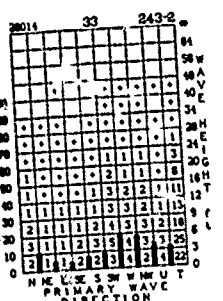
# WAVE HEIGHT AND



# WAVE HEIGHT AND PRIMARY WAVE DIRECTION

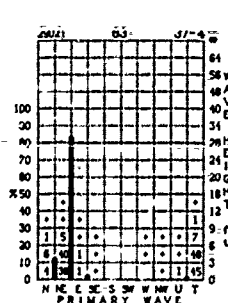
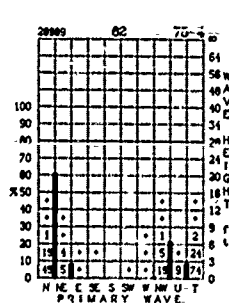
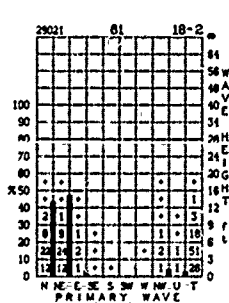
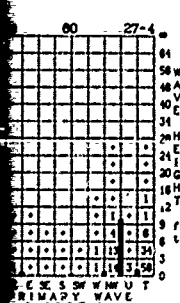
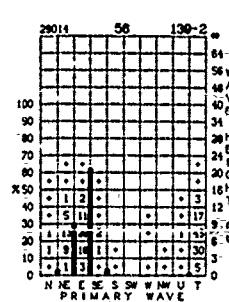
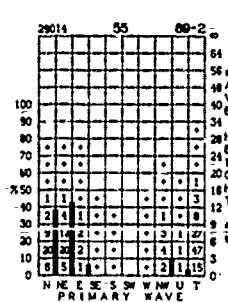
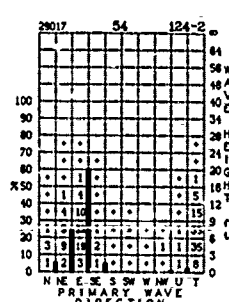
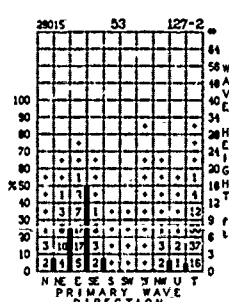
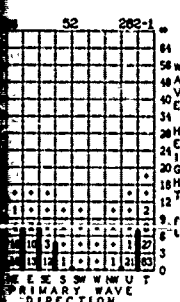
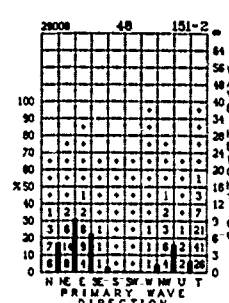
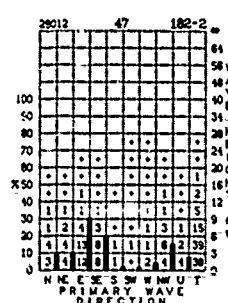
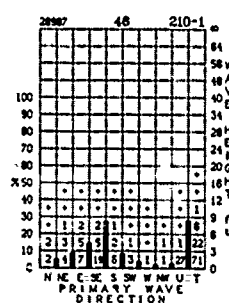
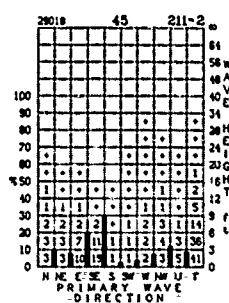
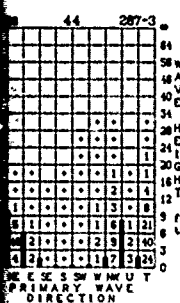
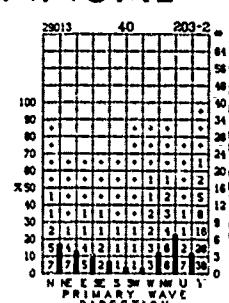
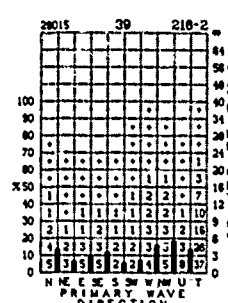
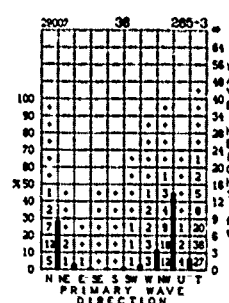
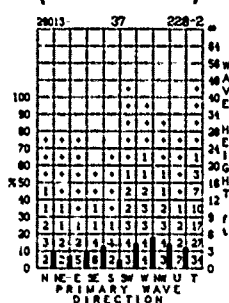
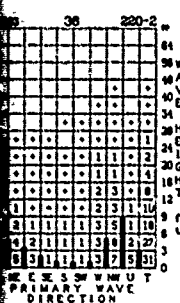


# WAVE HEIGHT AND PRIMARY WAVE DIRECTION (Cont'd)



# DIRECTION (Cont'd)

# ANNUAL

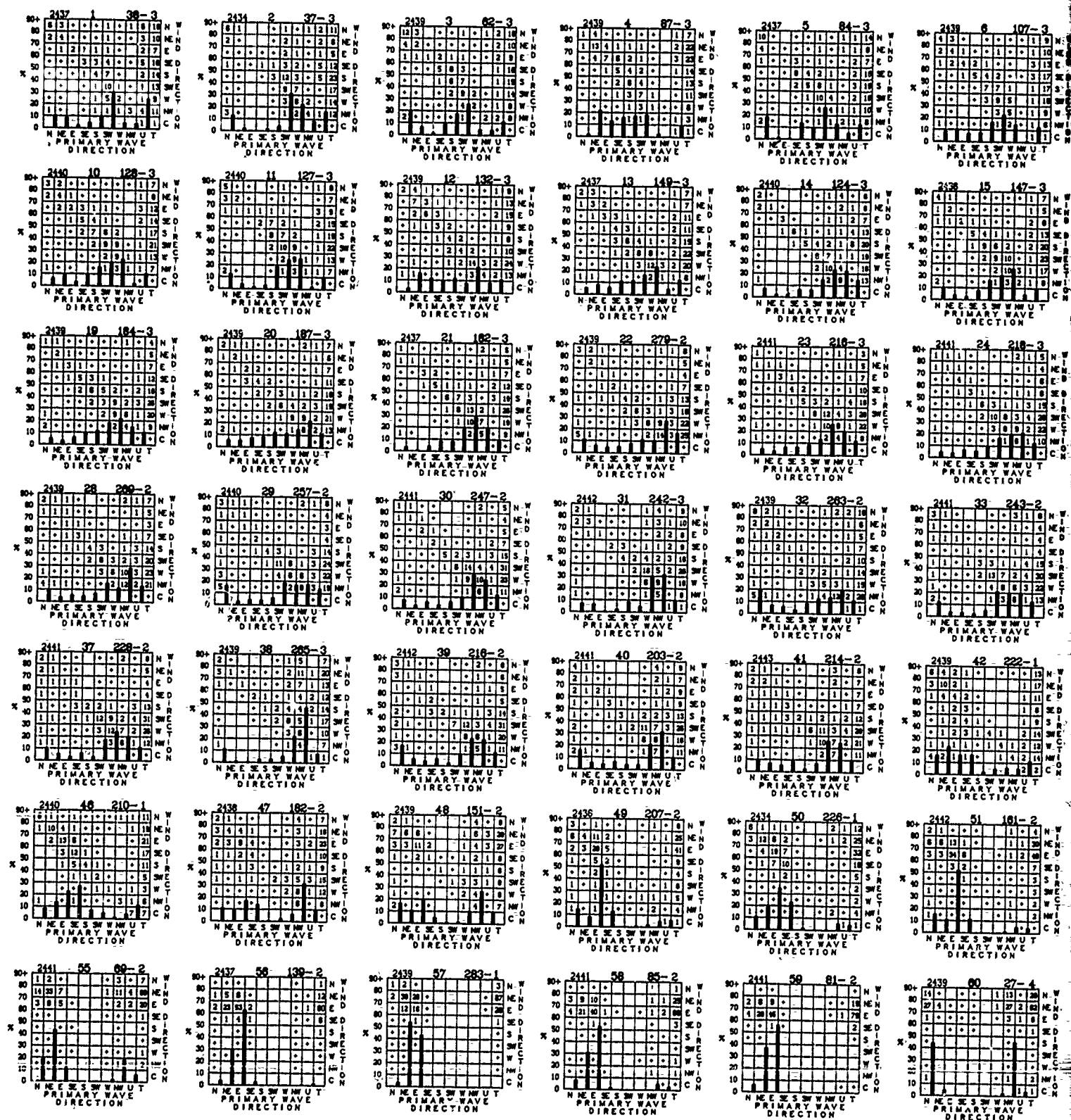


(2)



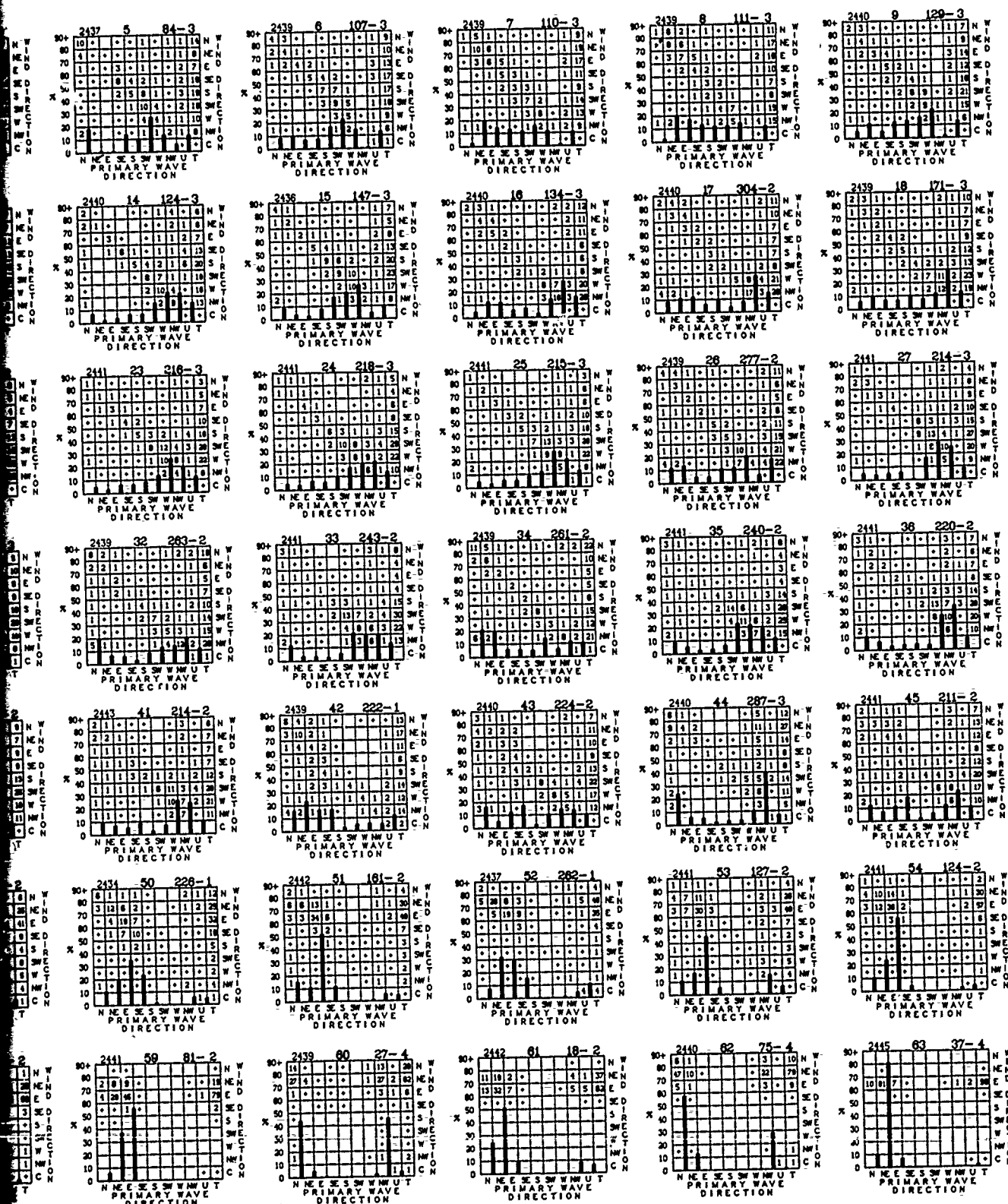
# JANUARY

# PRIMARY WAVE DIR

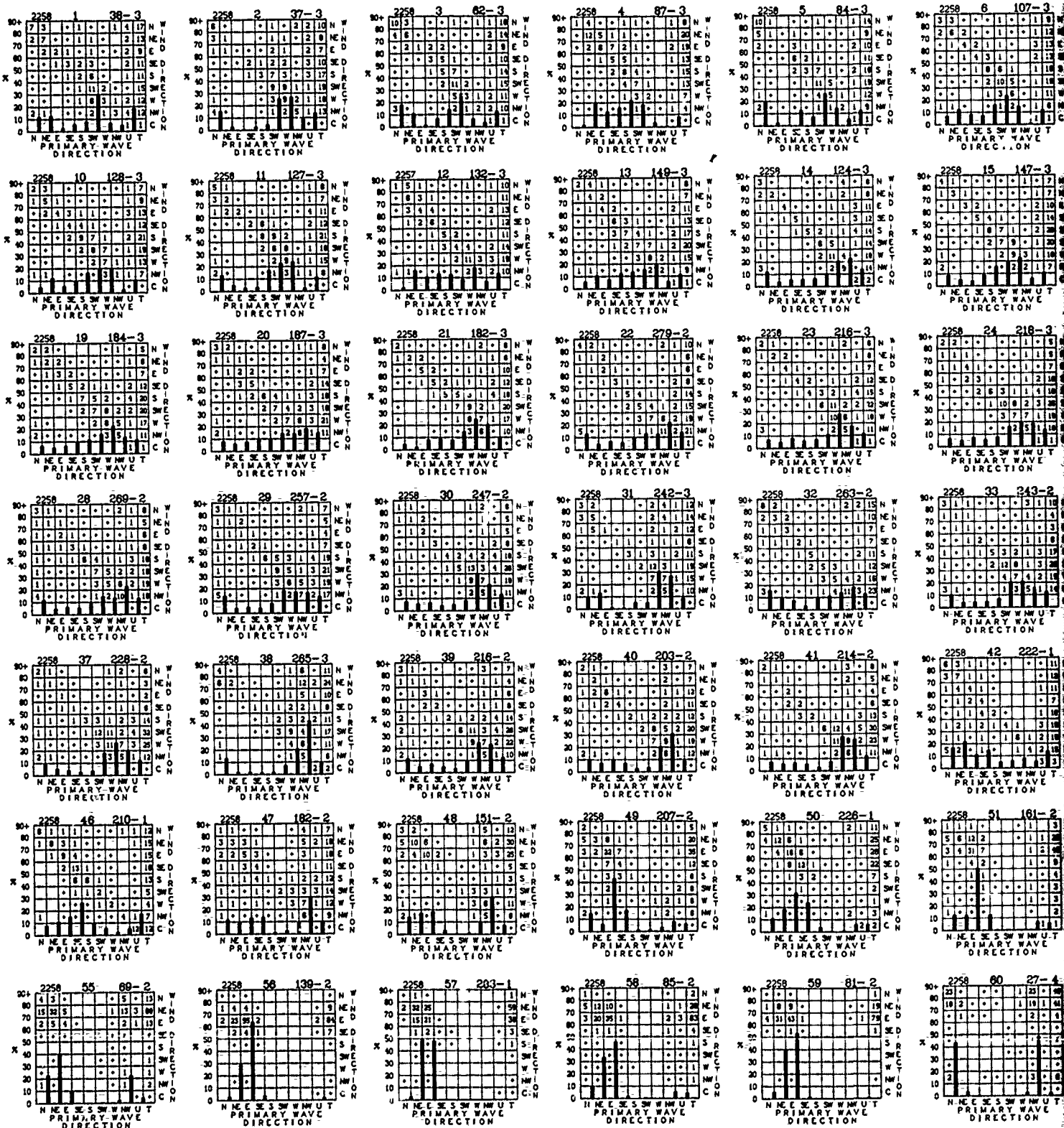




# PRIMARY WAVE DIRECTION AND WIND DIRECTION

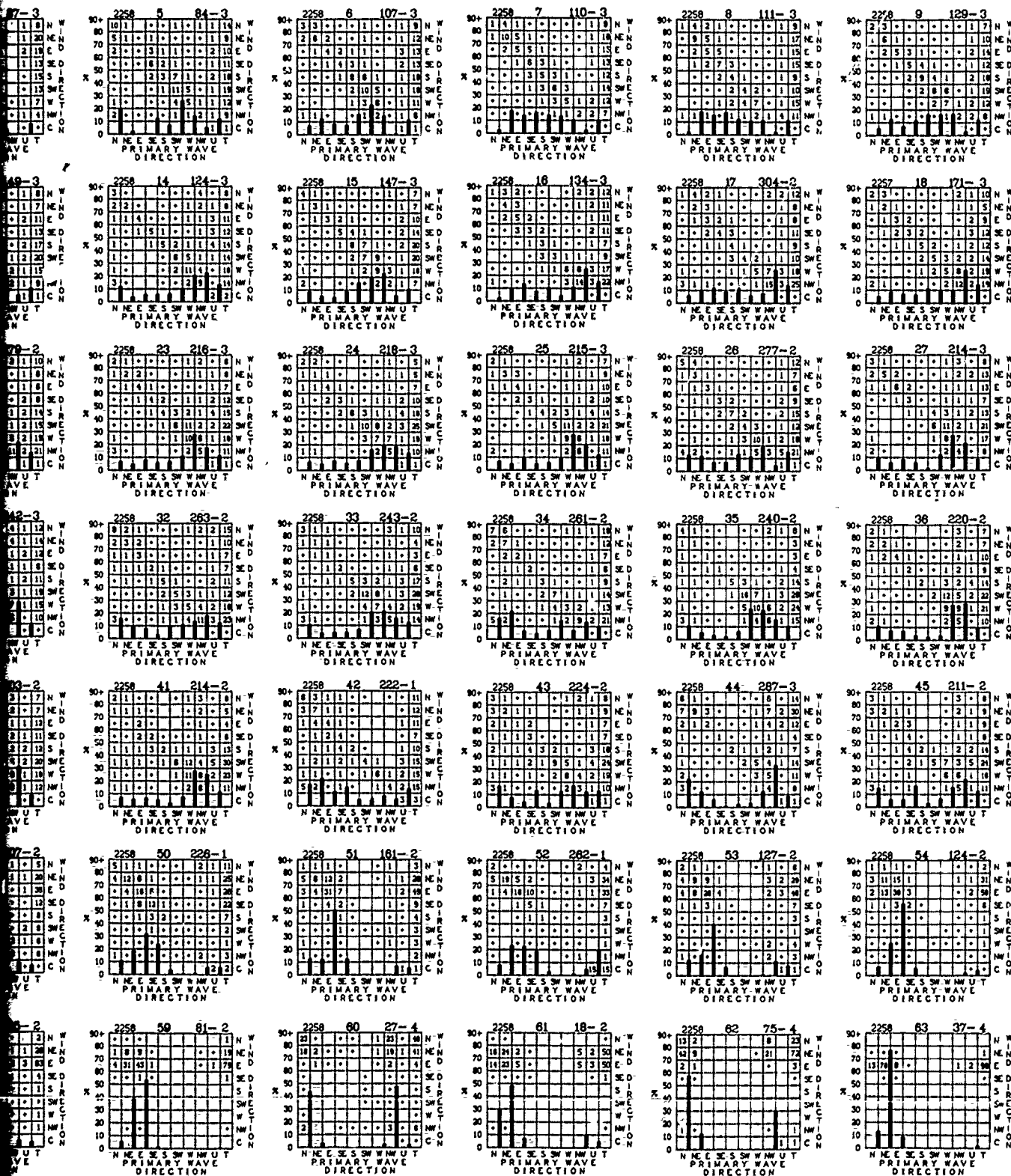


# PRIMARY WAVE DIRECTION AND WIND DIRECTION



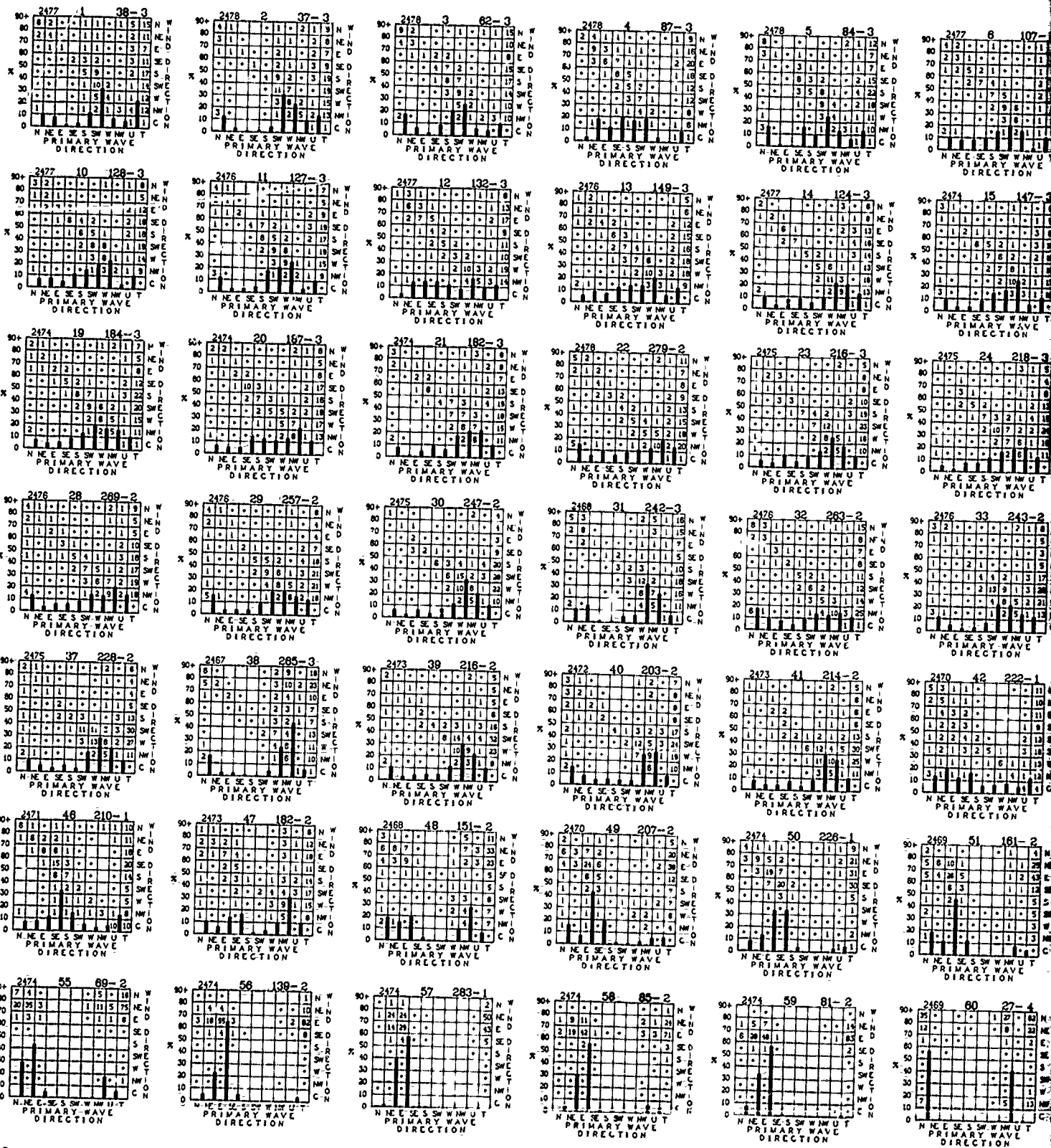
# ND DIRECTION

# FEBRUARY

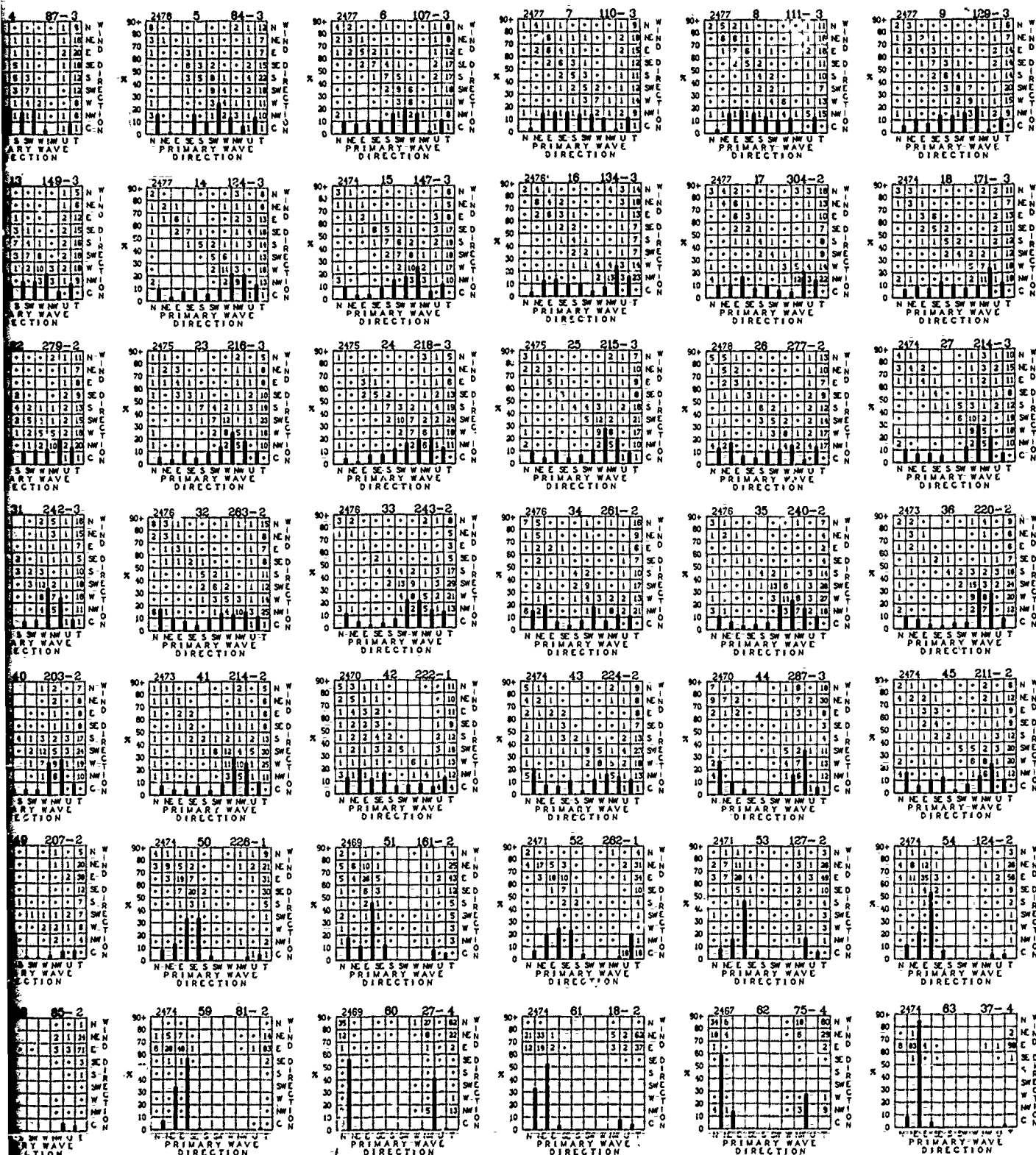


# MARCH

# PRIMARY WAVE DI

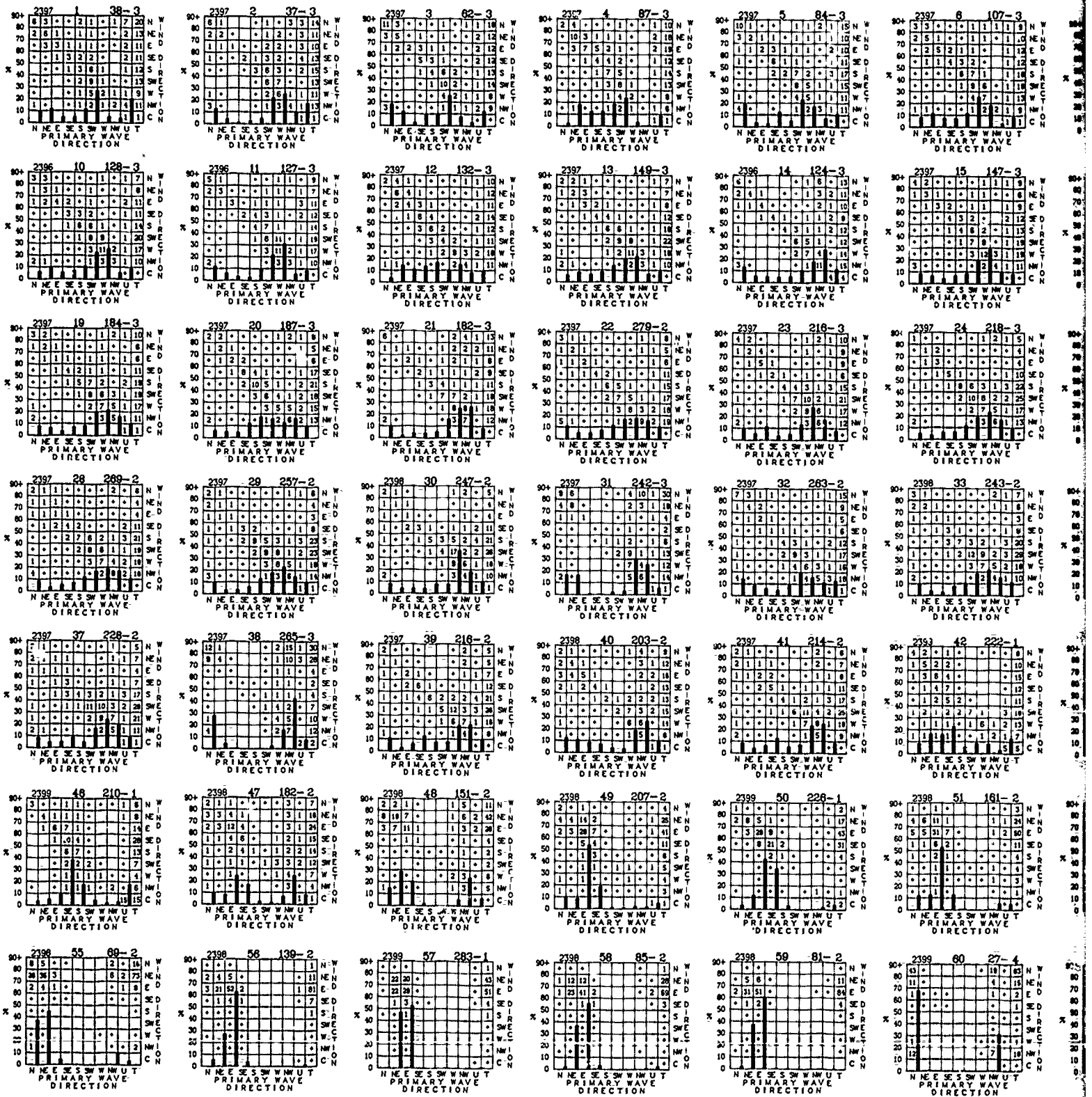


# PRIMARY WAVE DIRECTION AND WIND DIRECTION



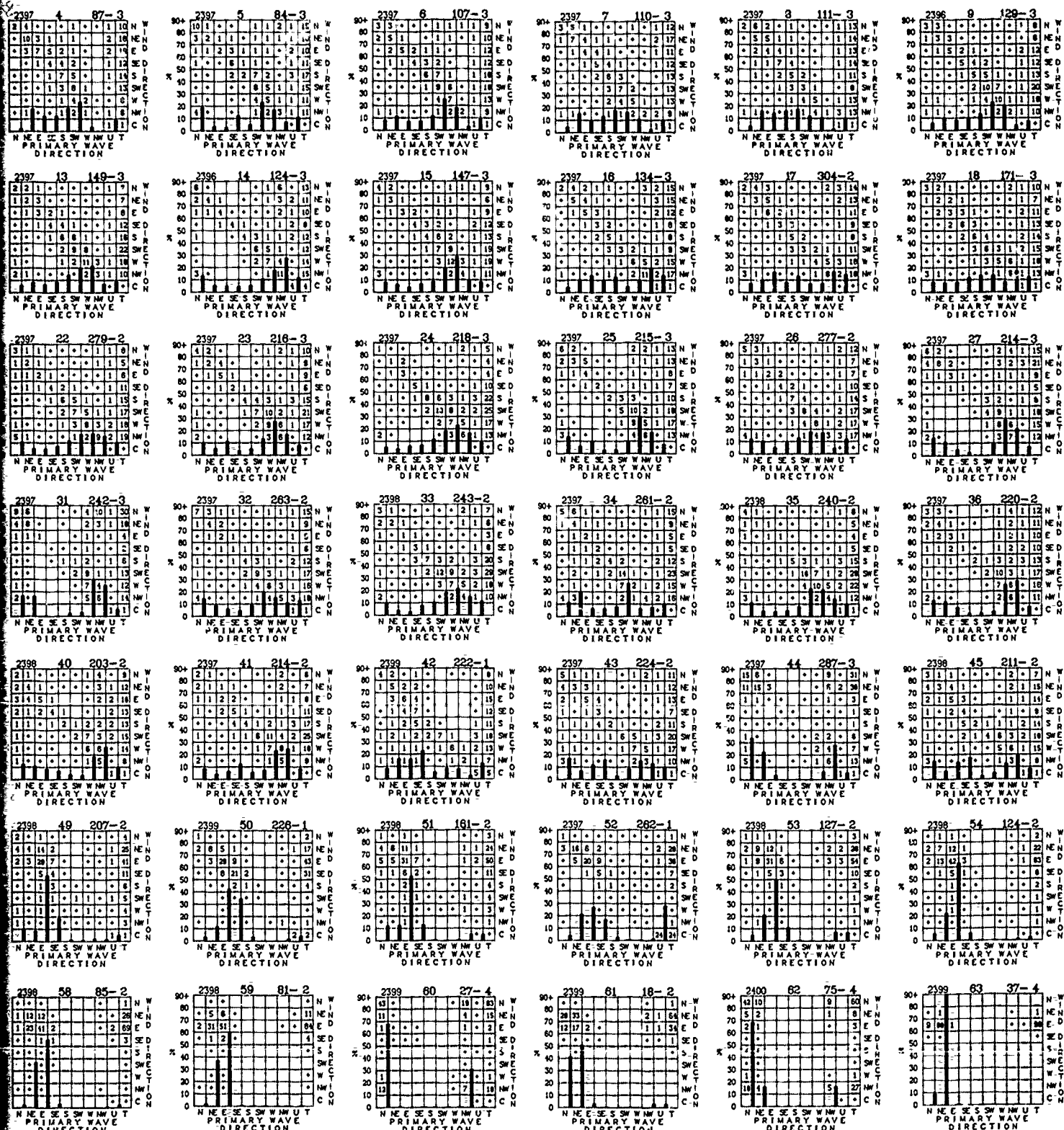


# PRIMARY WAVE DIRECTION AND WIND DIRECTION



# WIND DIRECTION

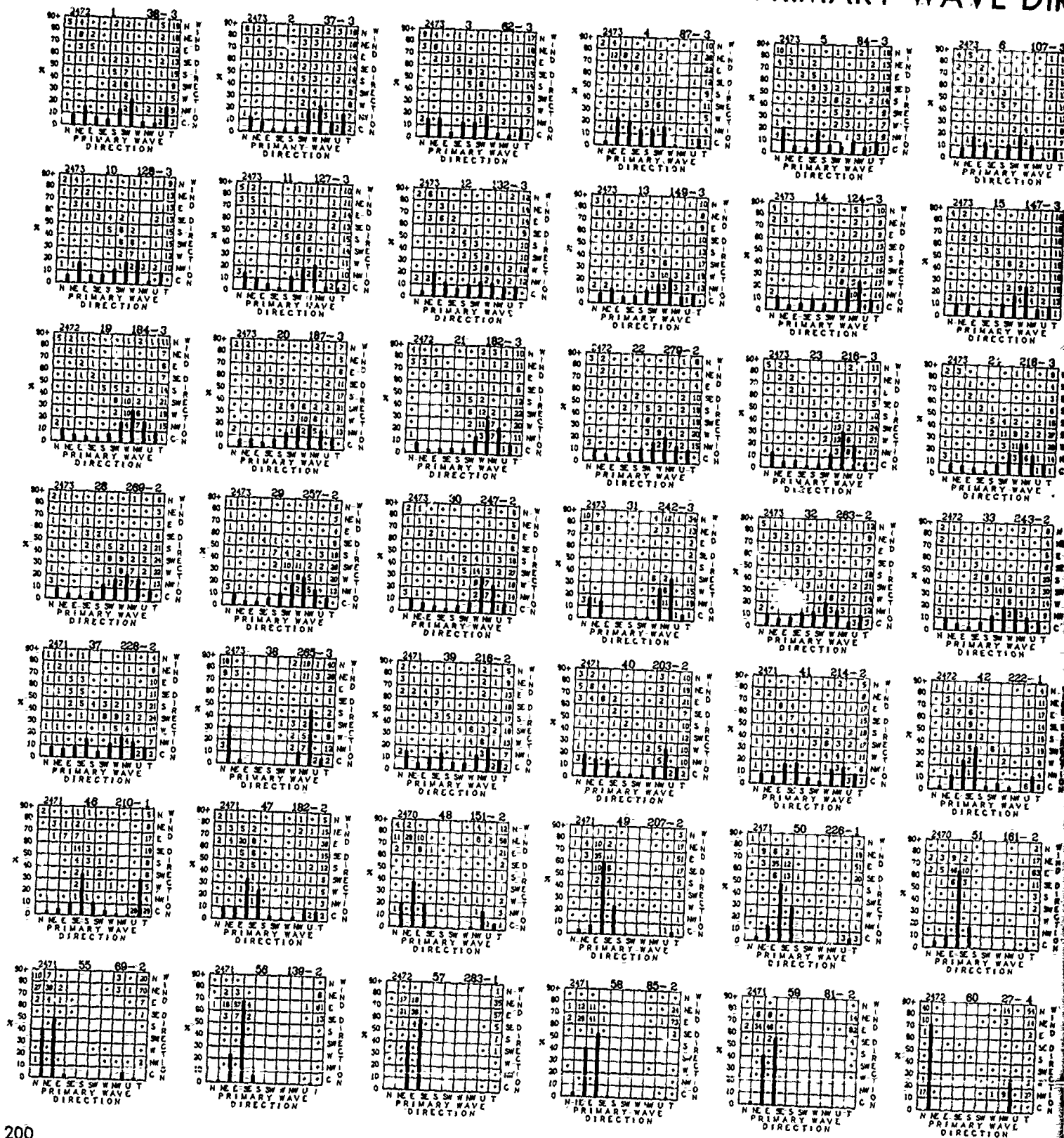
APRIL



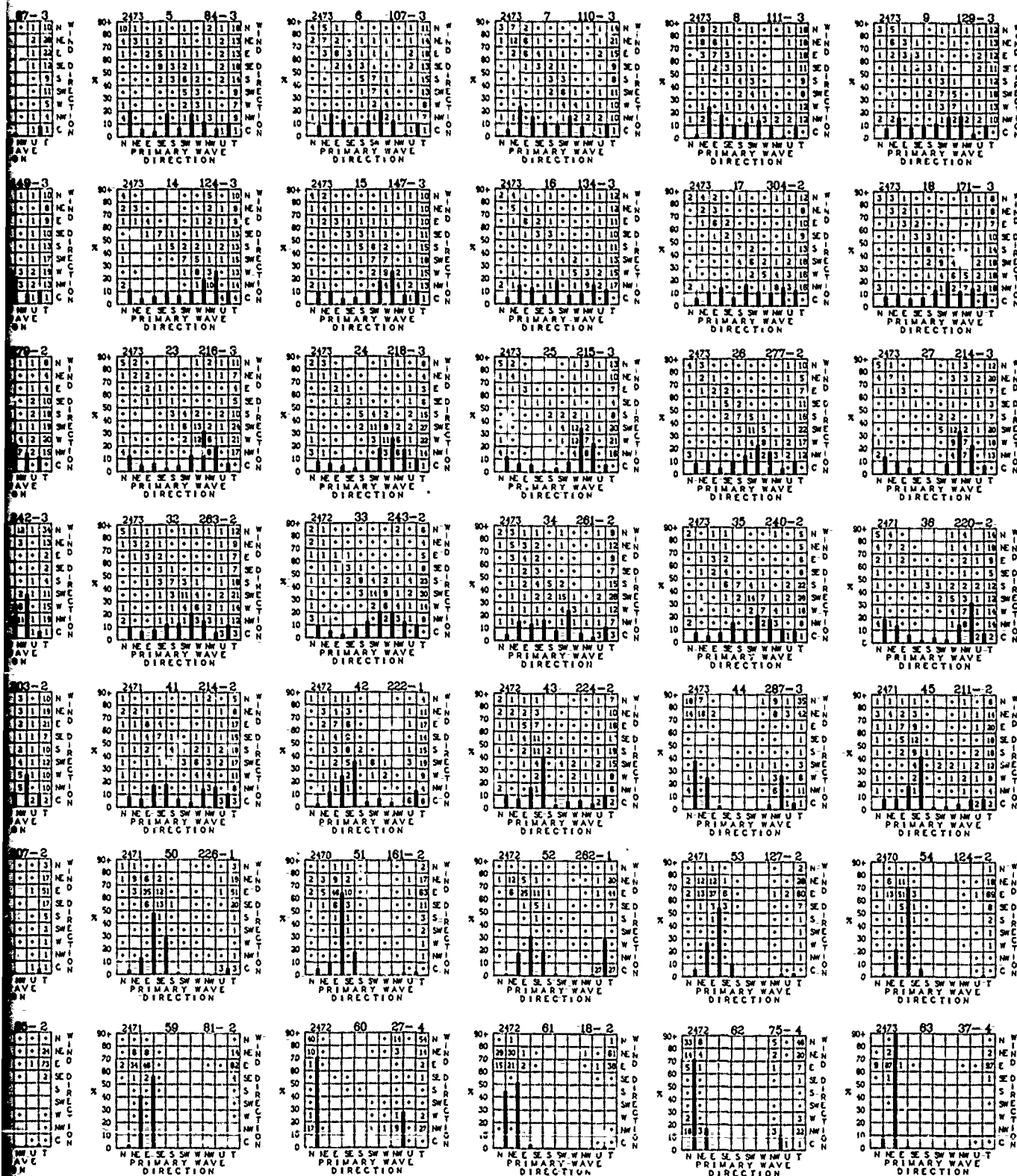


MAY

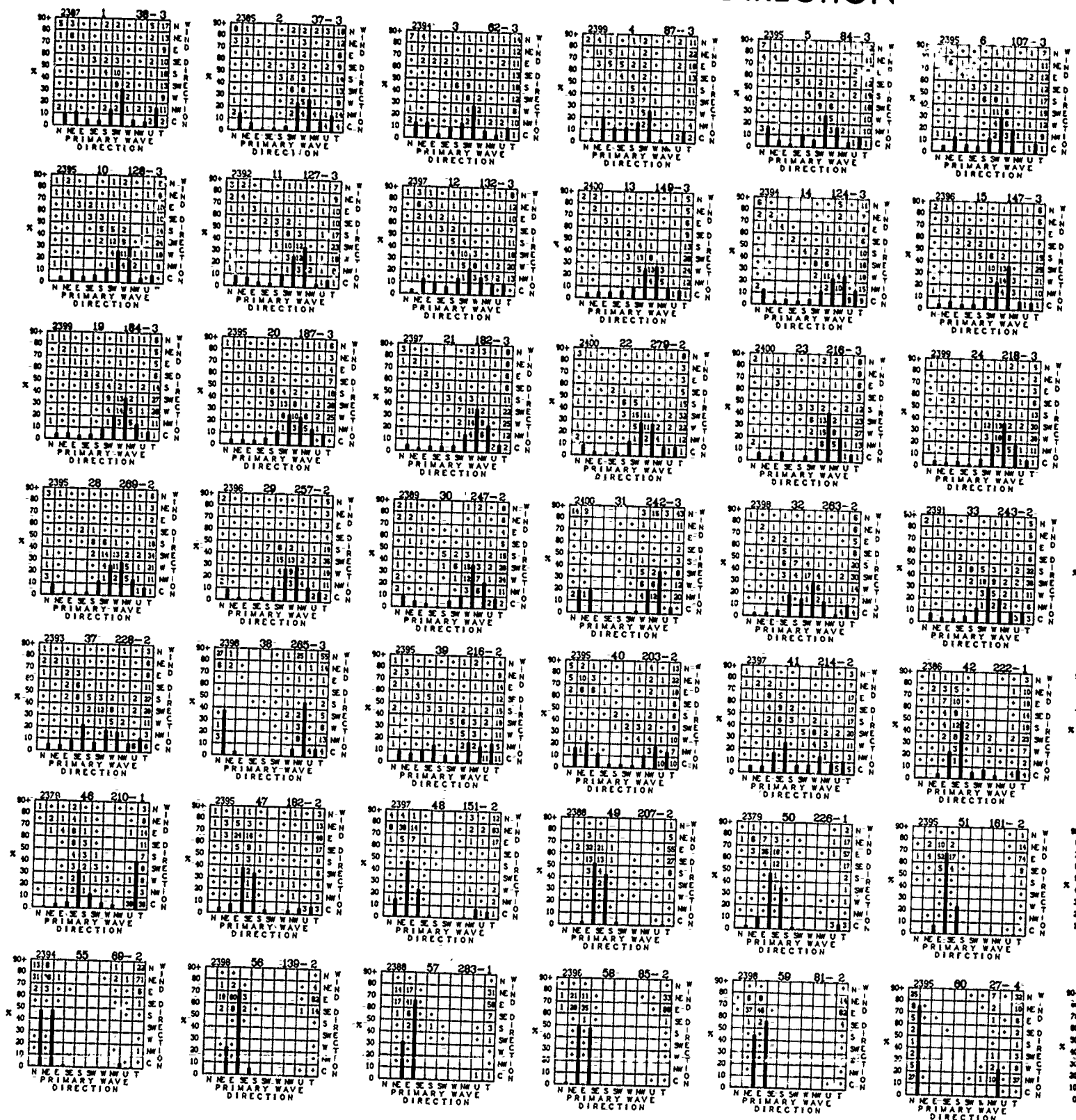
# PRIMARY WAVE DIR



# PRIMARY WAVE DIRECTION AND WIND DIRECTION

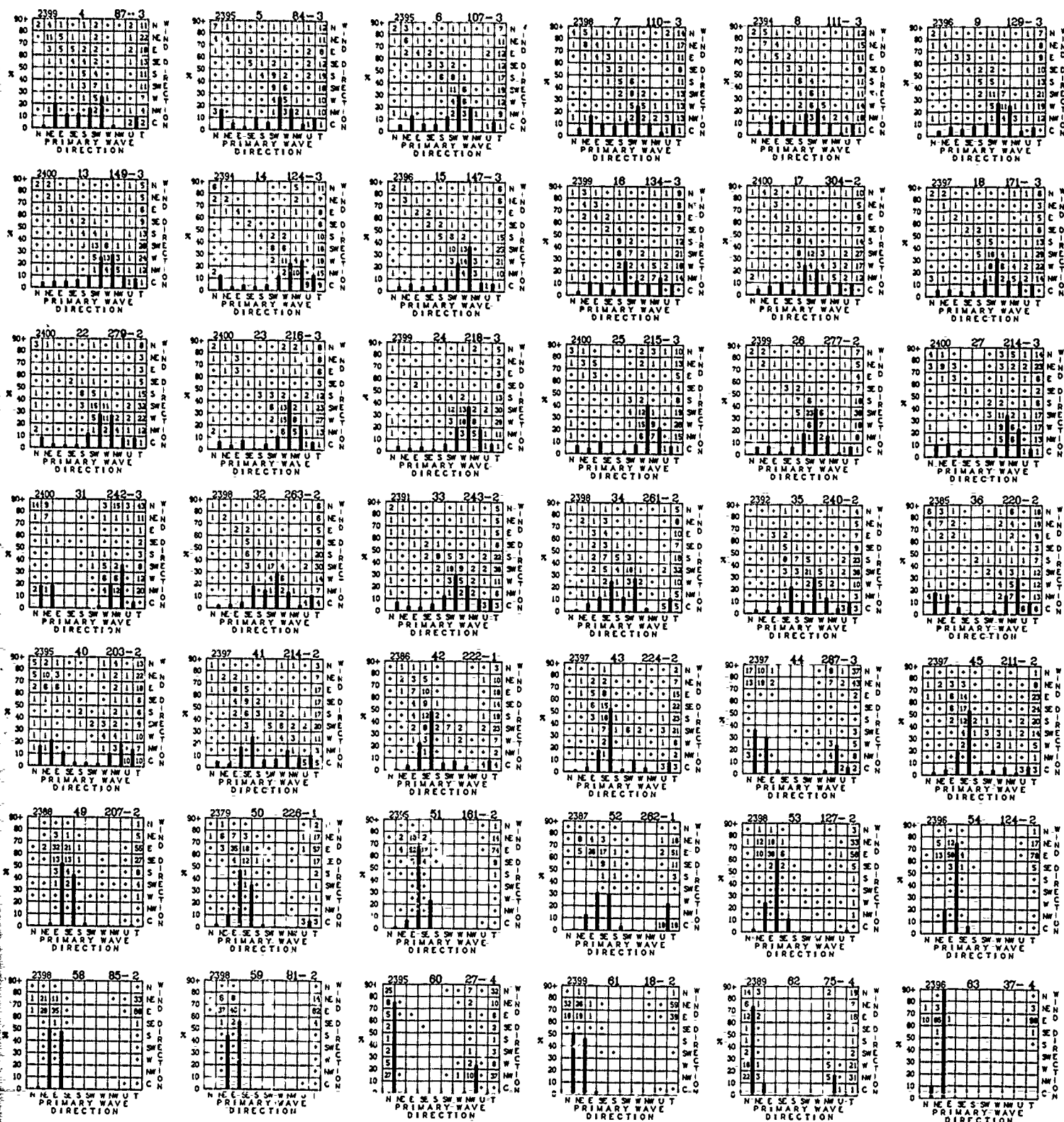


# PRIMARY WAVE DIRECTION AND WIND DIRECTION



# AND WIND DIRECTION

## JUNE

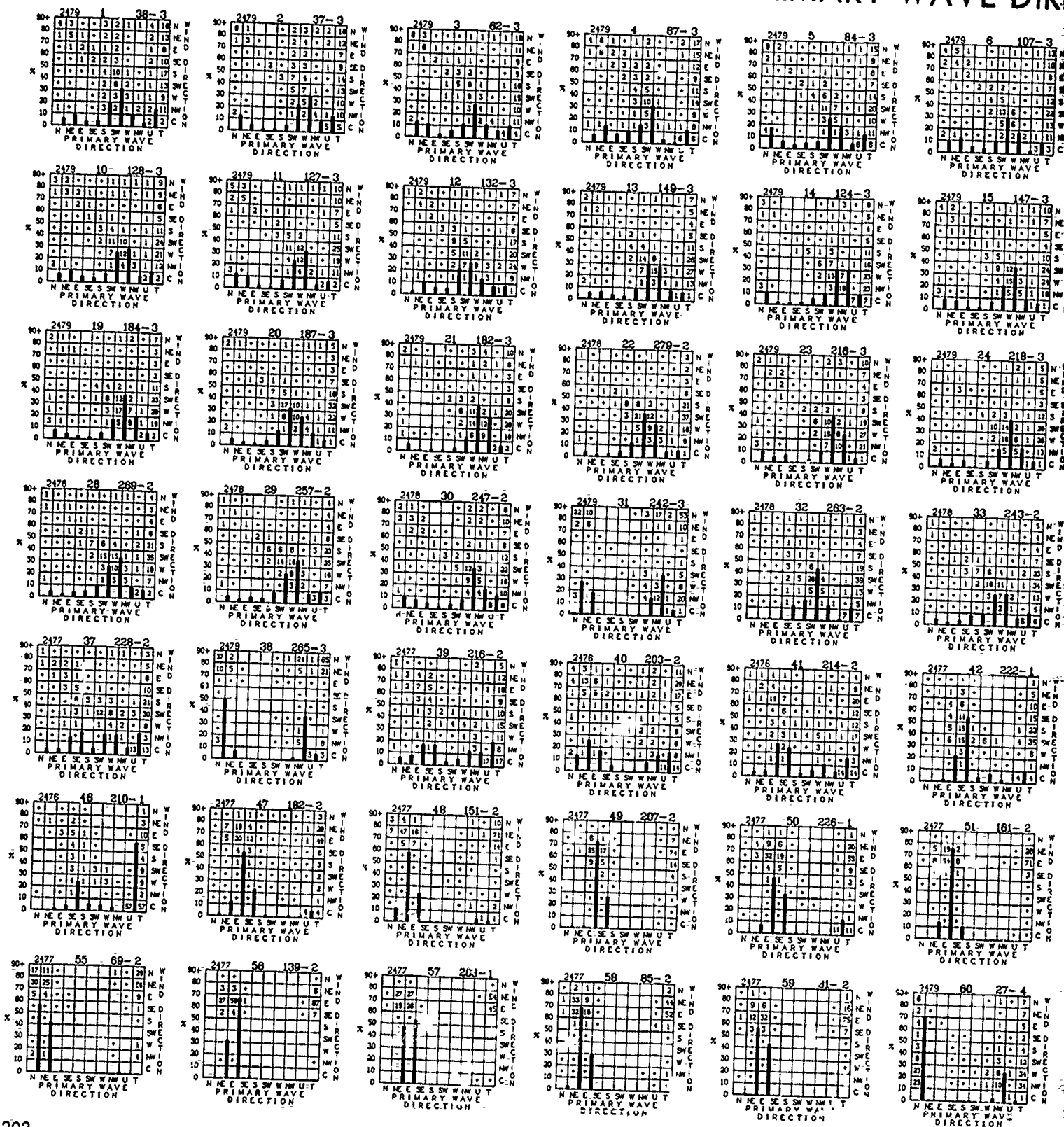


2



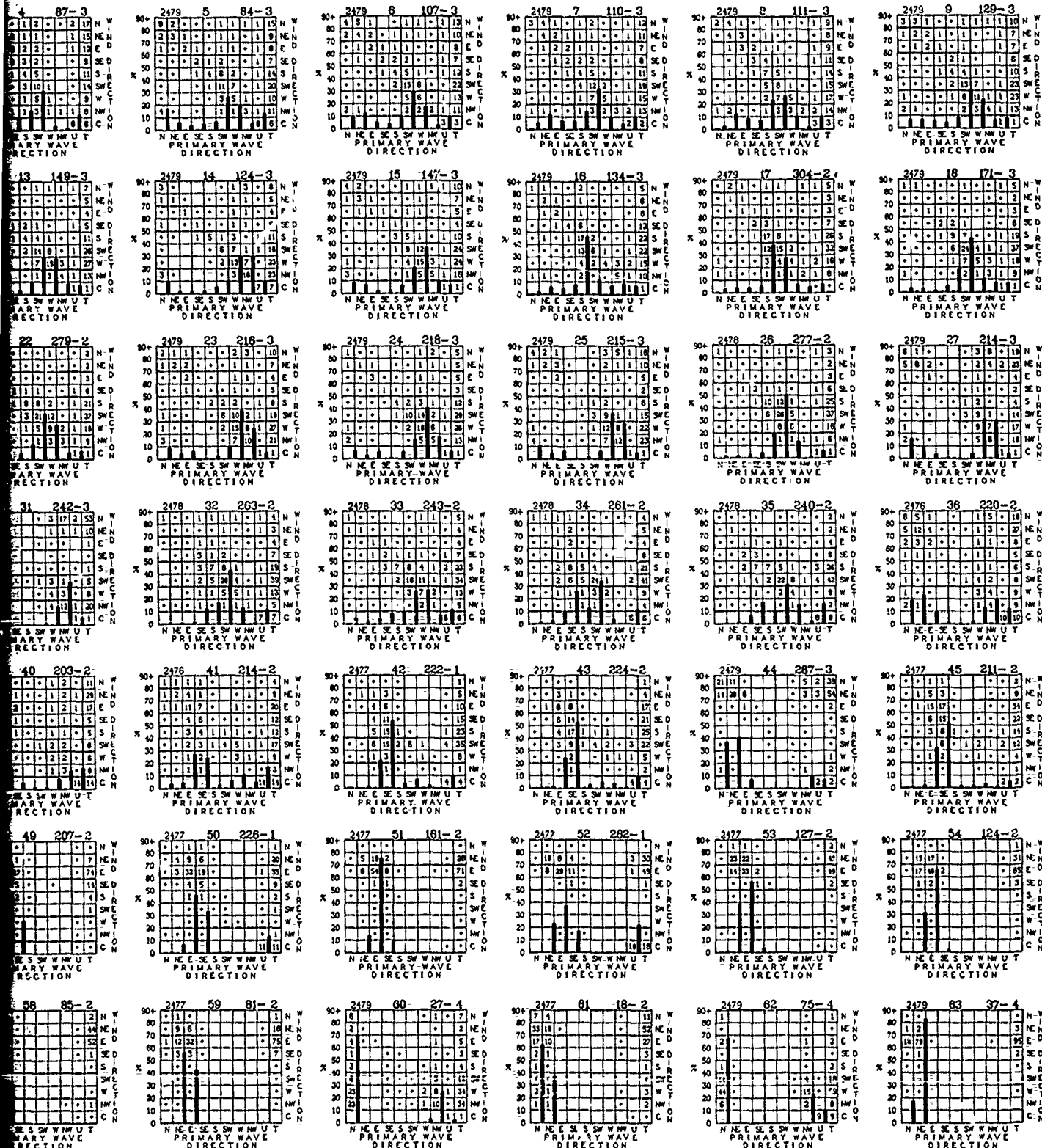
JULY

# PRIMARY WAVE DIR

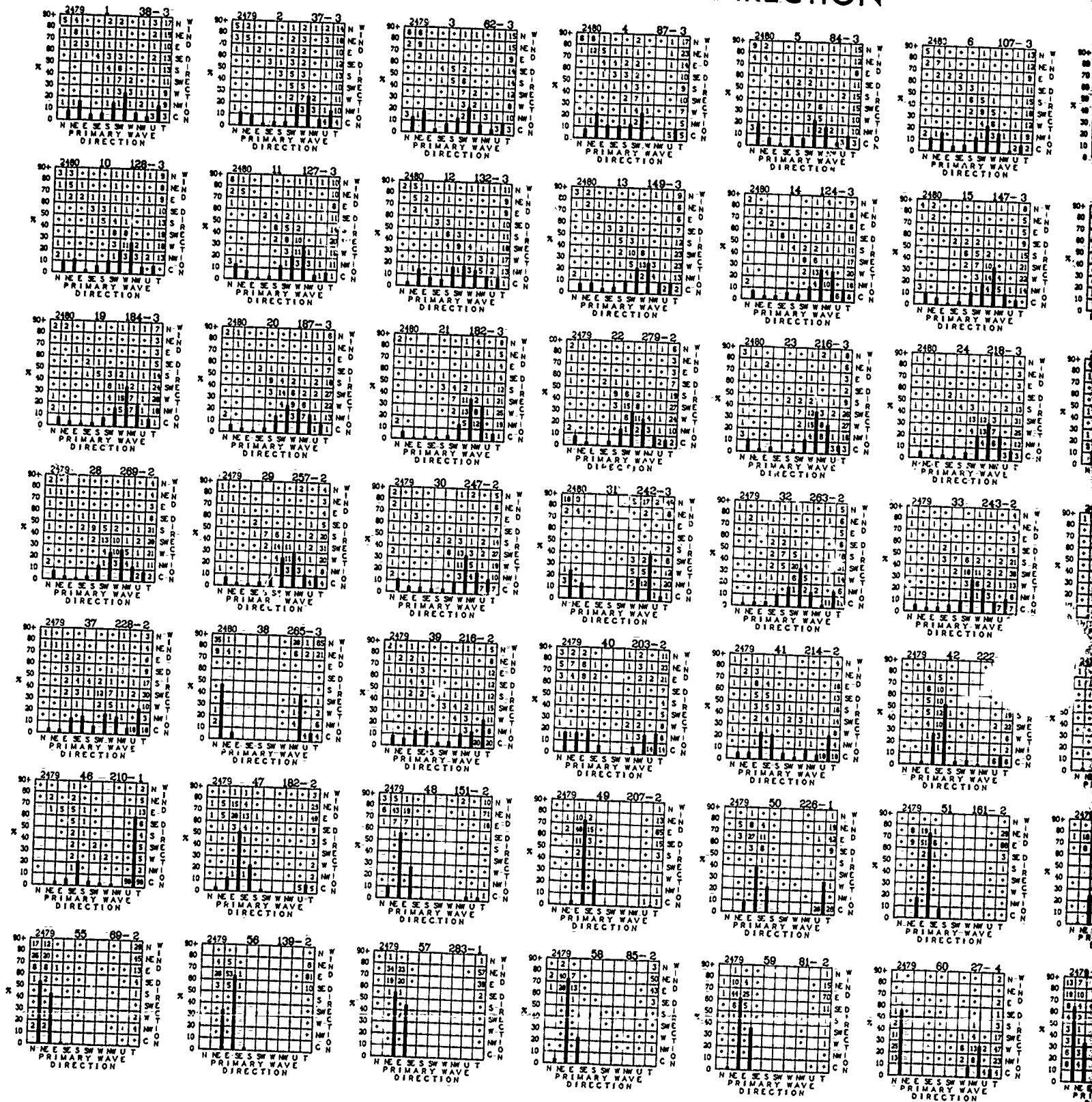


(1)

# PRIMARY WAVE DIRECTION AND WIND DIRECTION



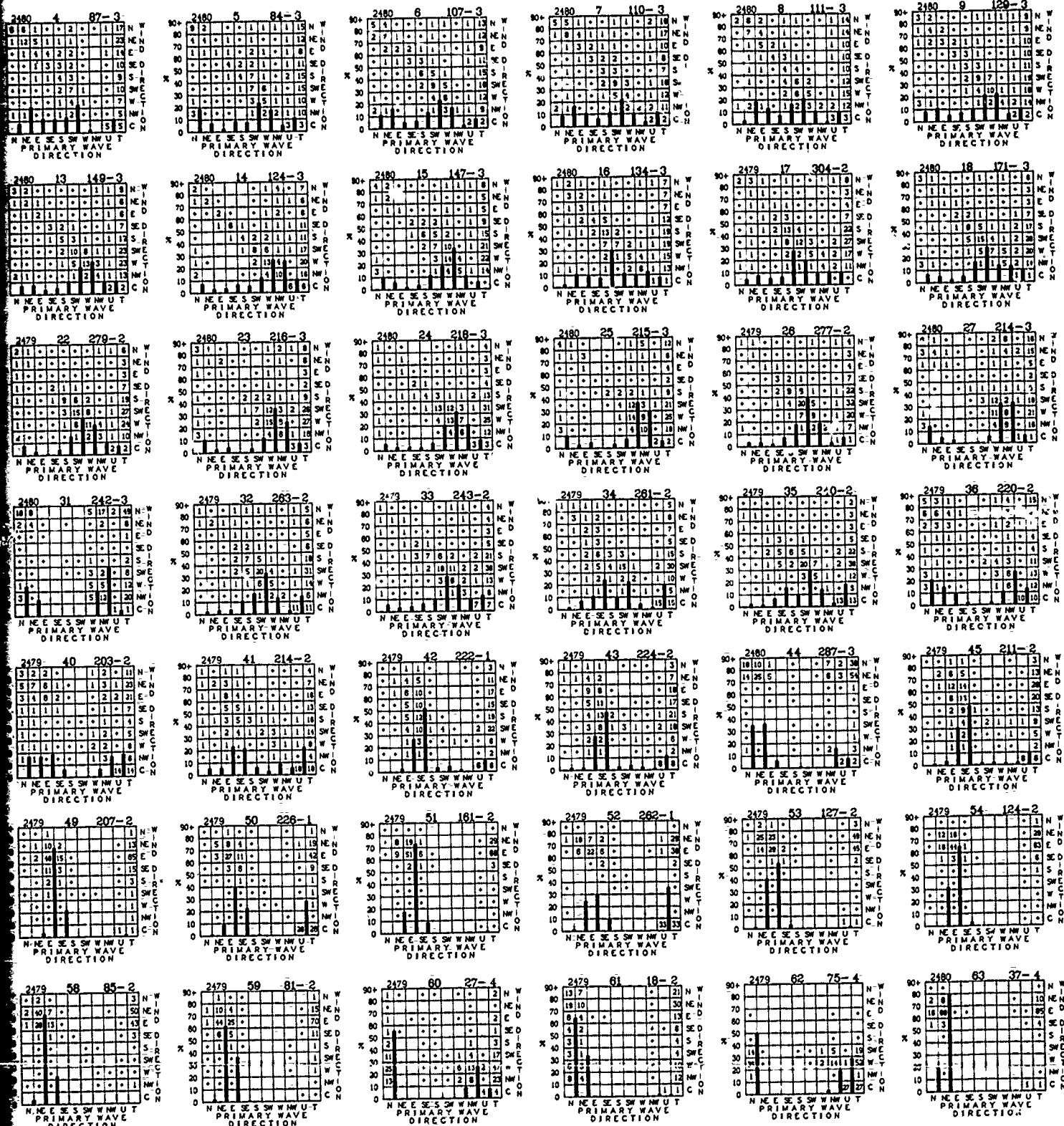
# PRIMARY WAVE DIRECTION AND WIND DIRECTION





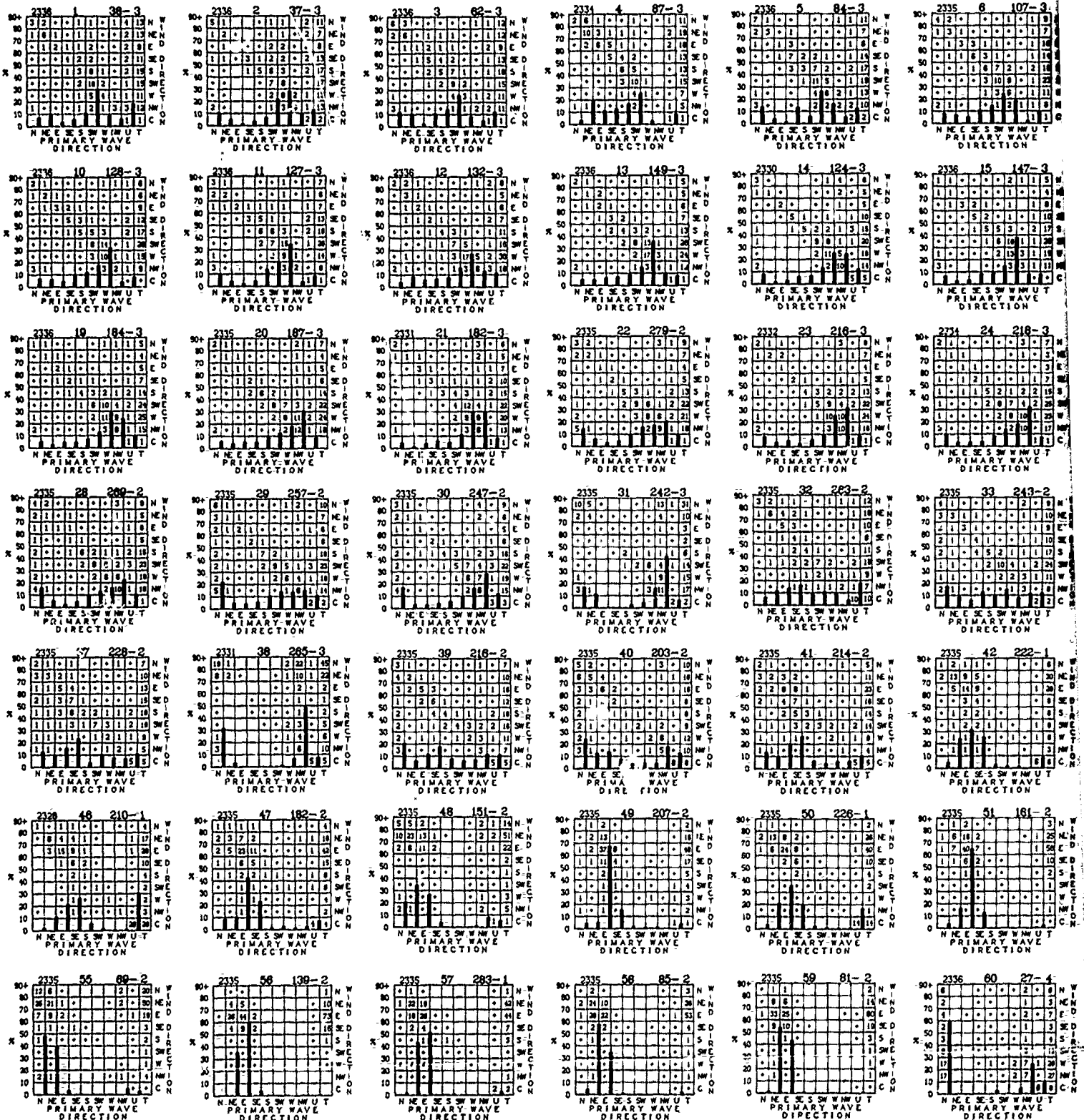
# D WIND DIRECTION

## AUGUST

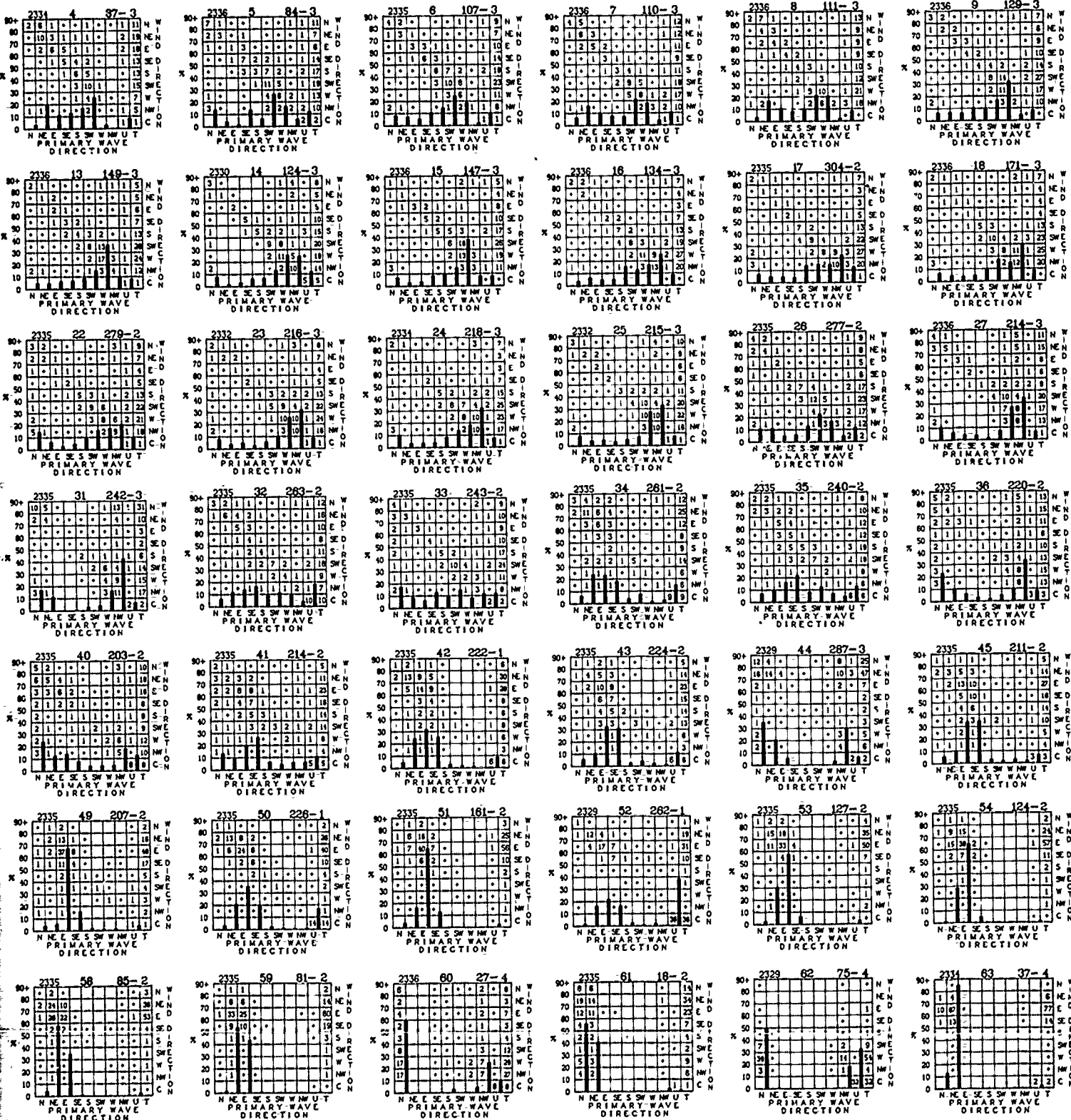


# SEPTEMBER

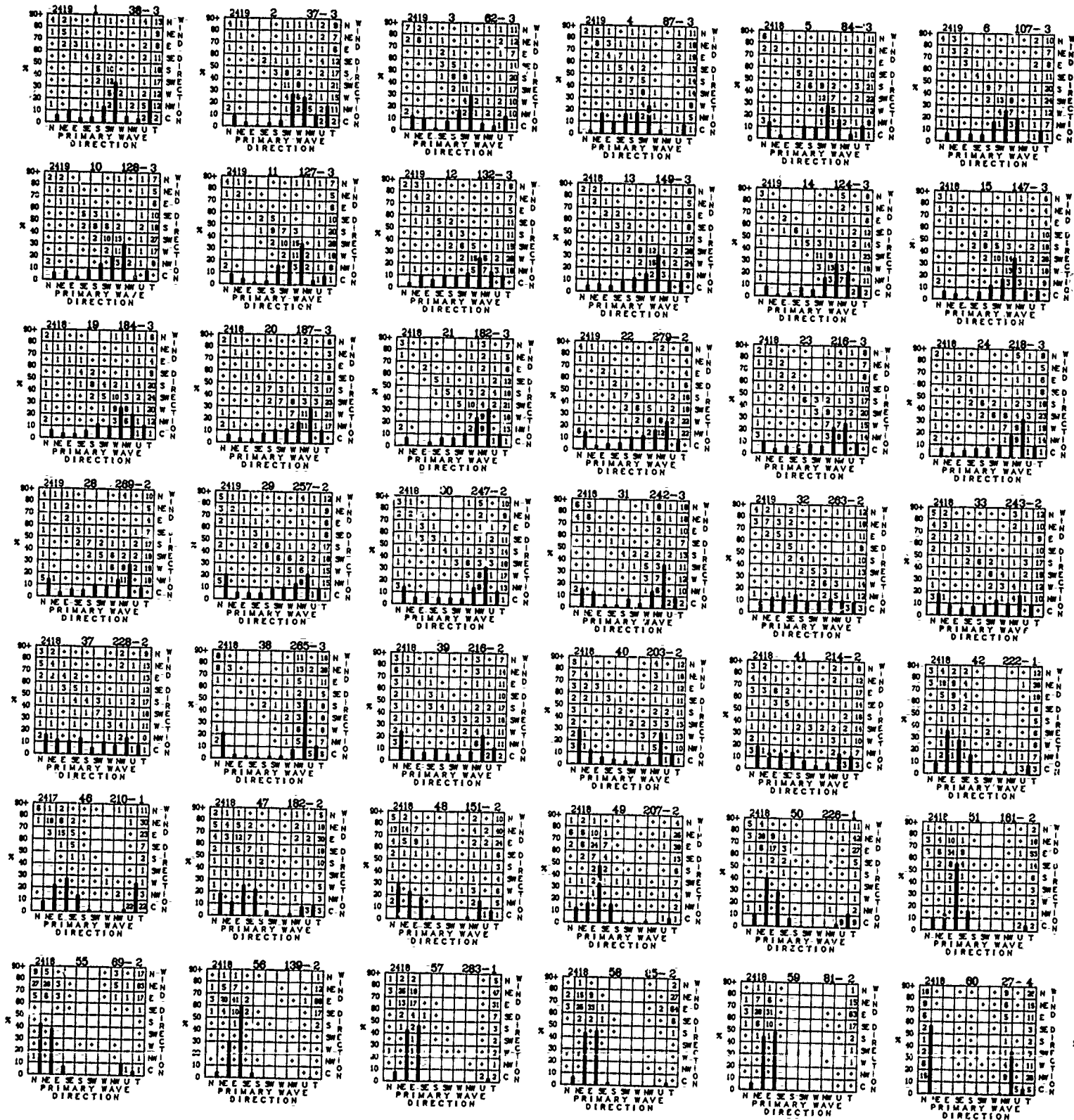
# PRIMARY WAVE DIR



# PRIMARY WAVE DIRECTION AND WIND DIRECTION



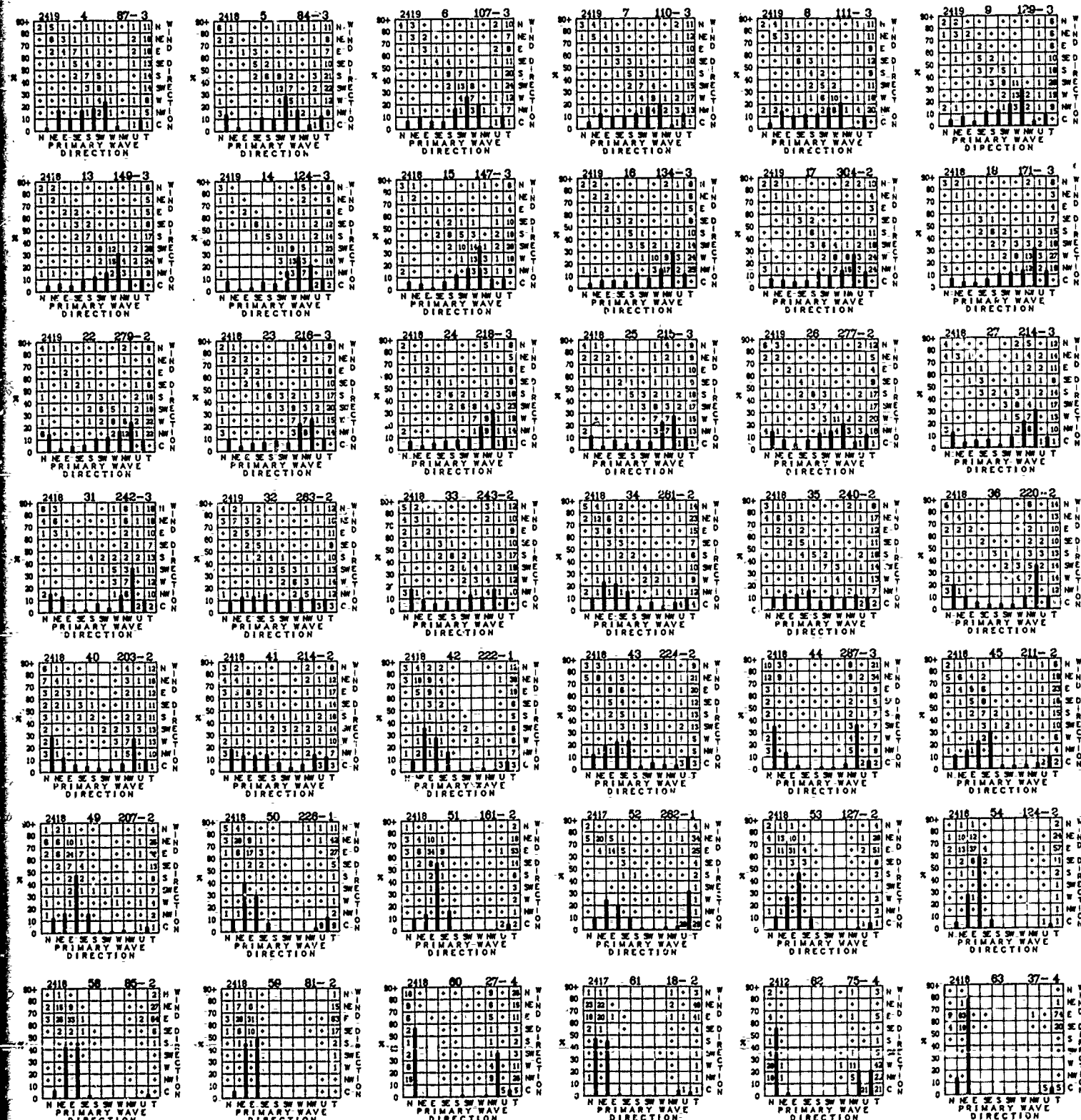
# PRIMARY WAVE DIRECTION AND WIND DIRECTION





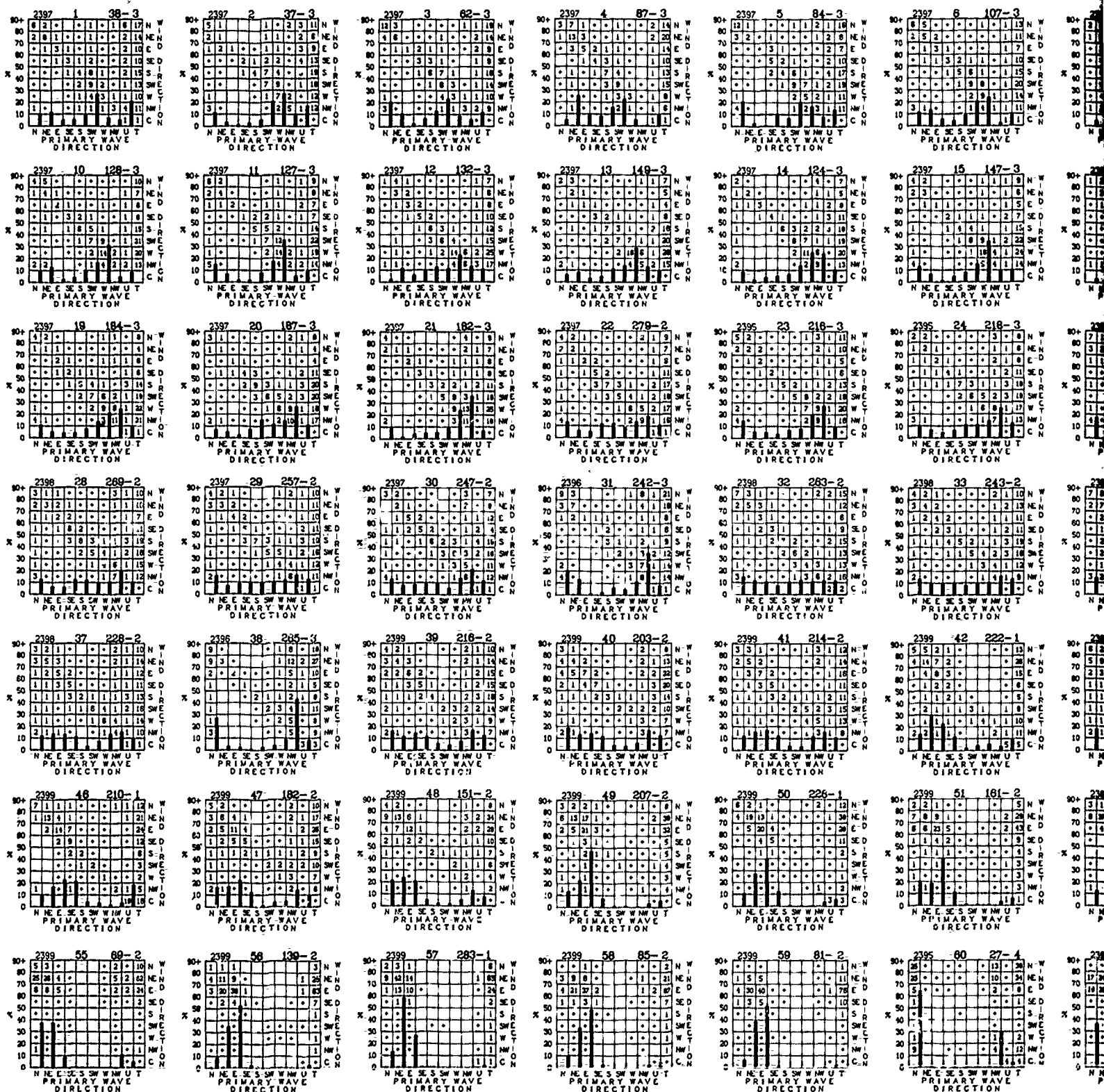
# ND WIND DIRECTION

# OCTOBER

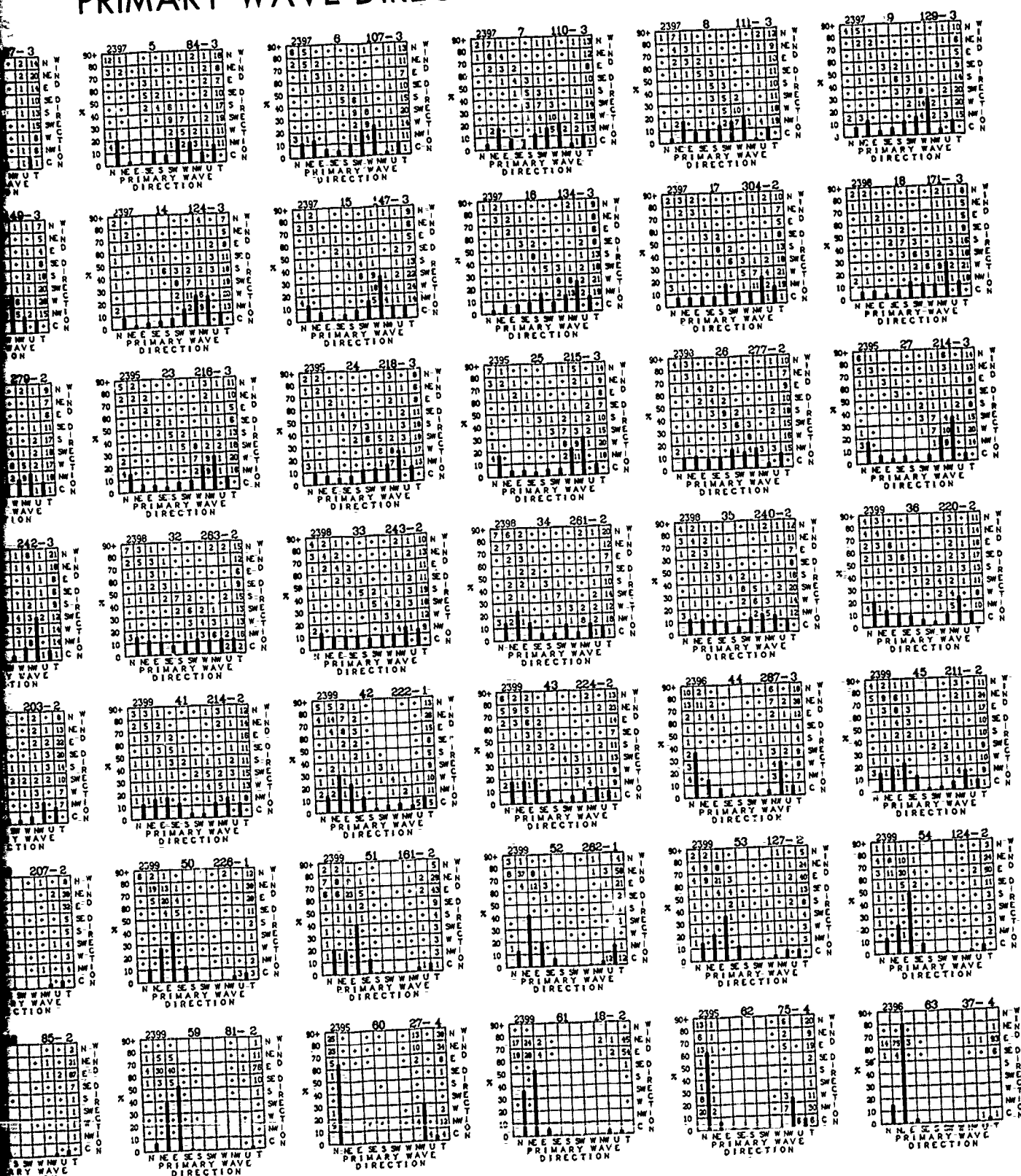


# NOVEMBER

# PRIMARY WAVE DIRECTION

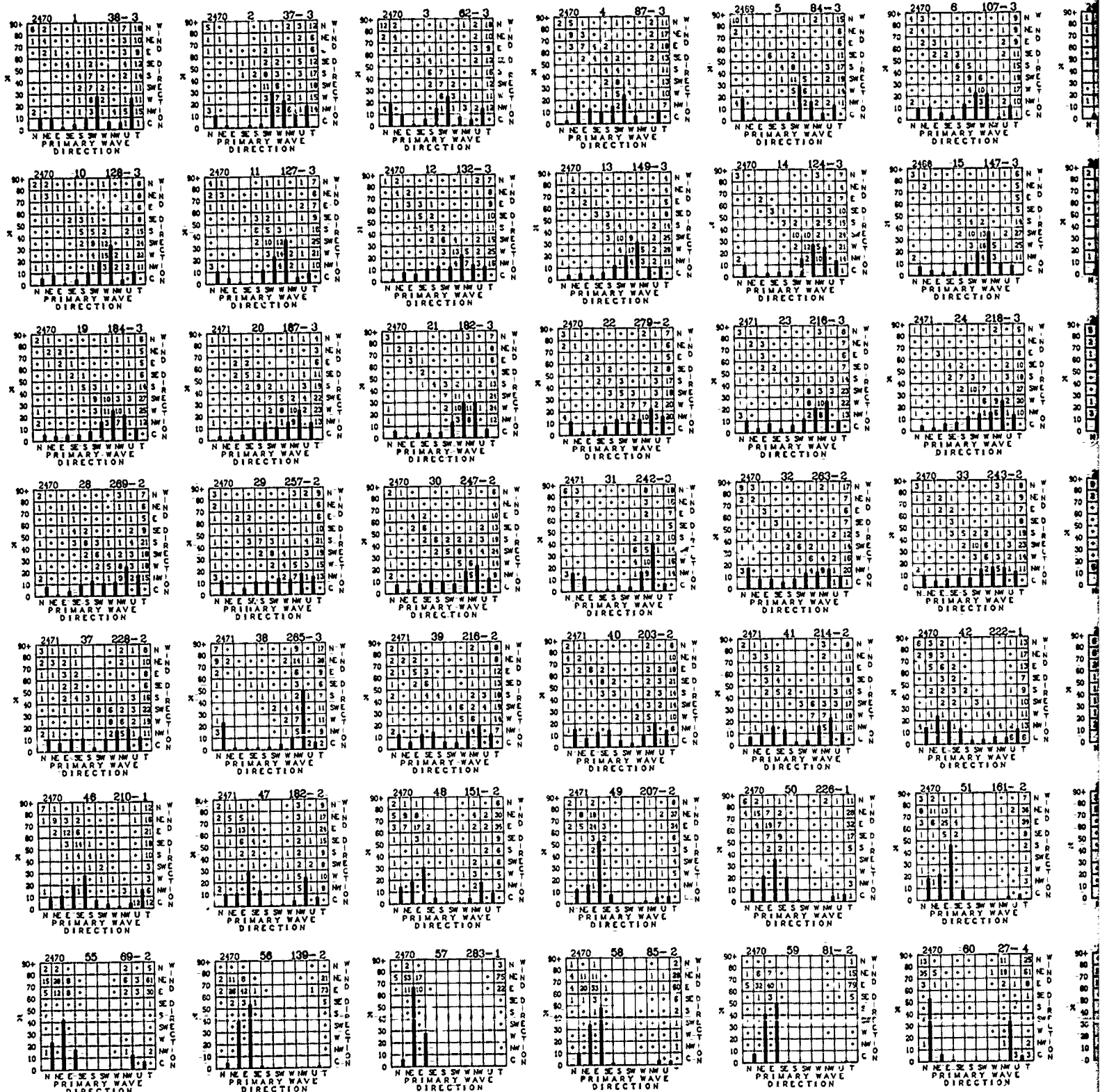


# PRIMARY WAVE DIRECTION AND WIND DIRECTION



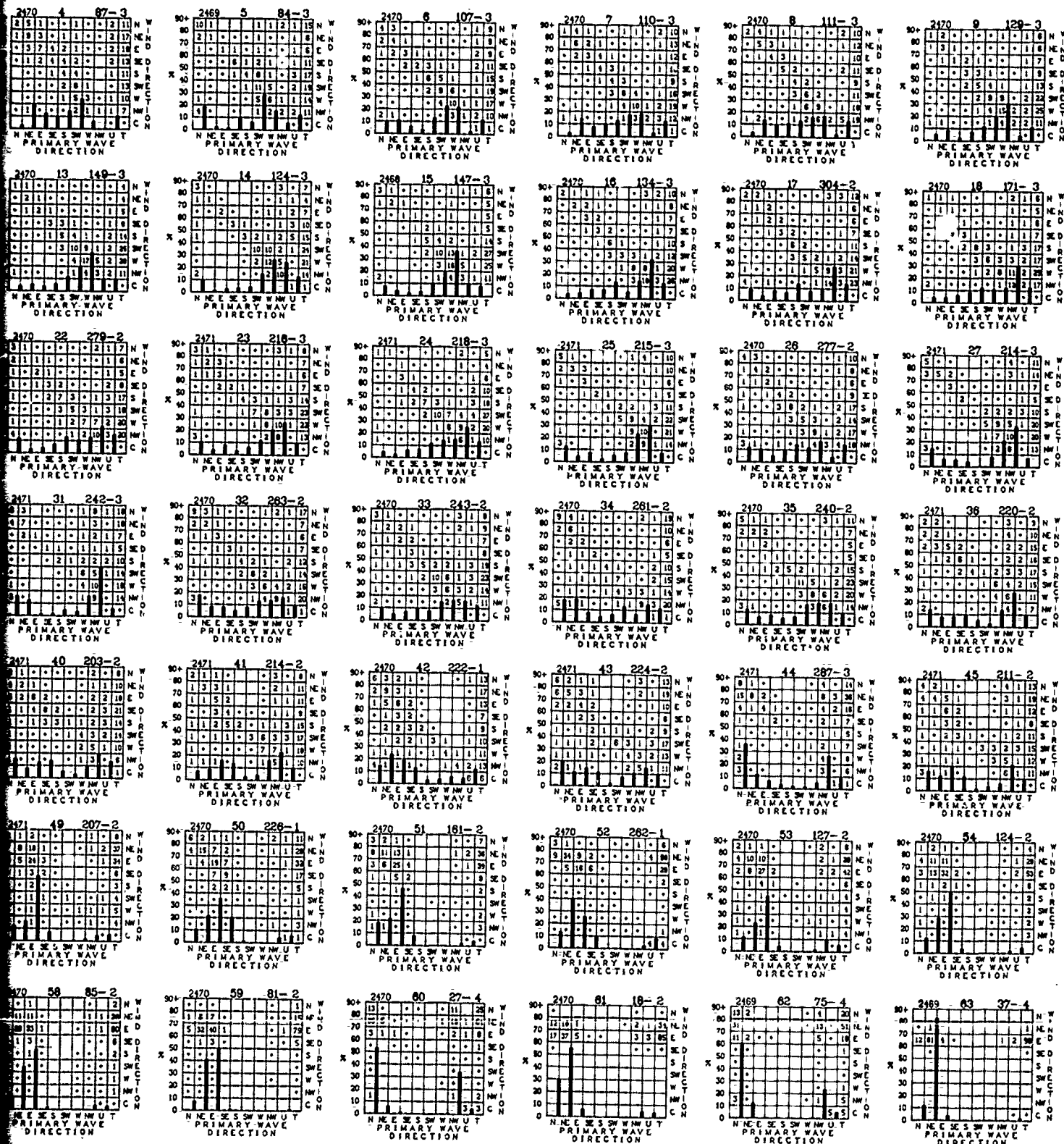


# PRIMARY WAVE DIRECTION AND WIND DIRECTION



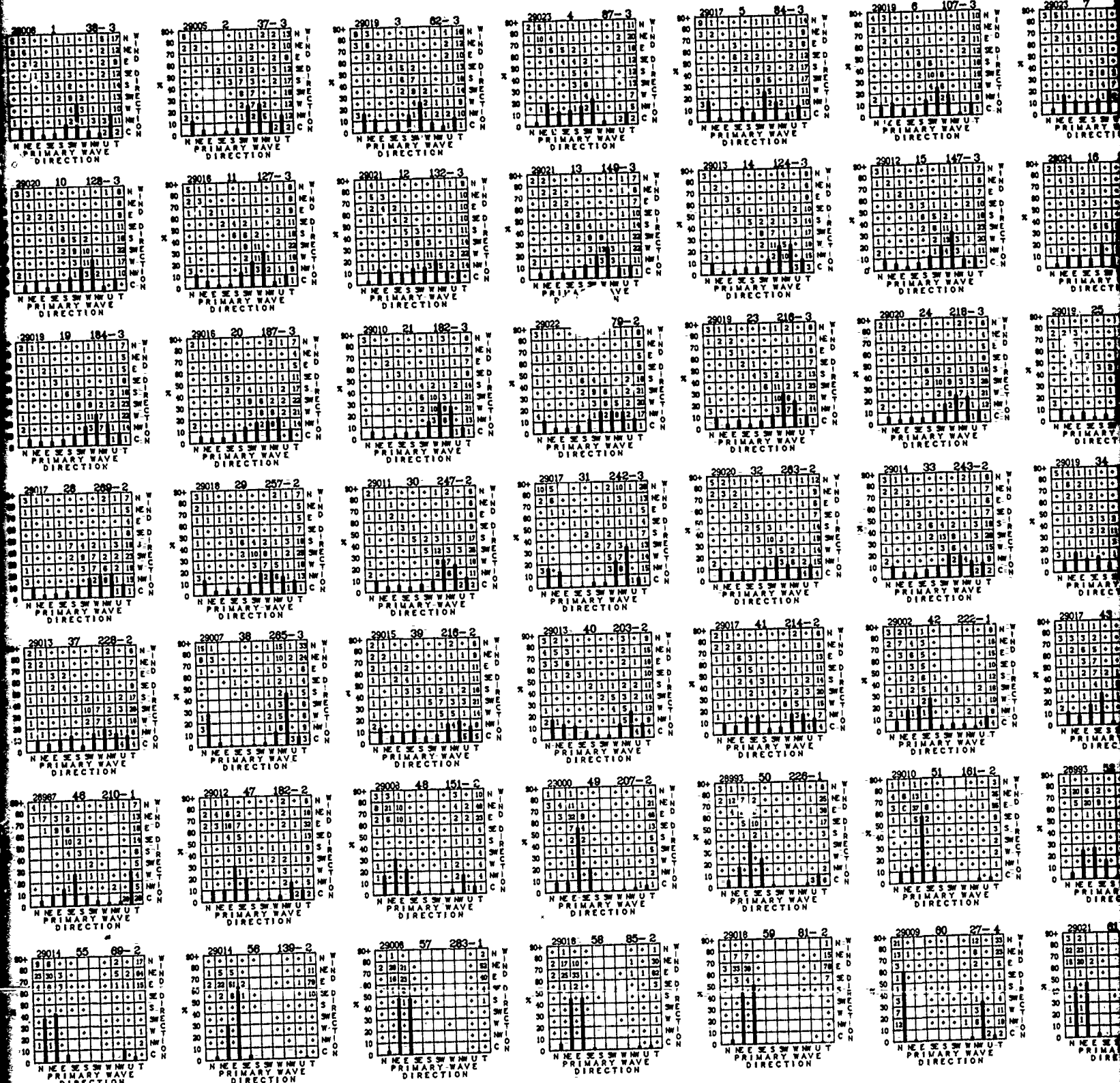
# D WIND DIRECTION

# DECEMBER

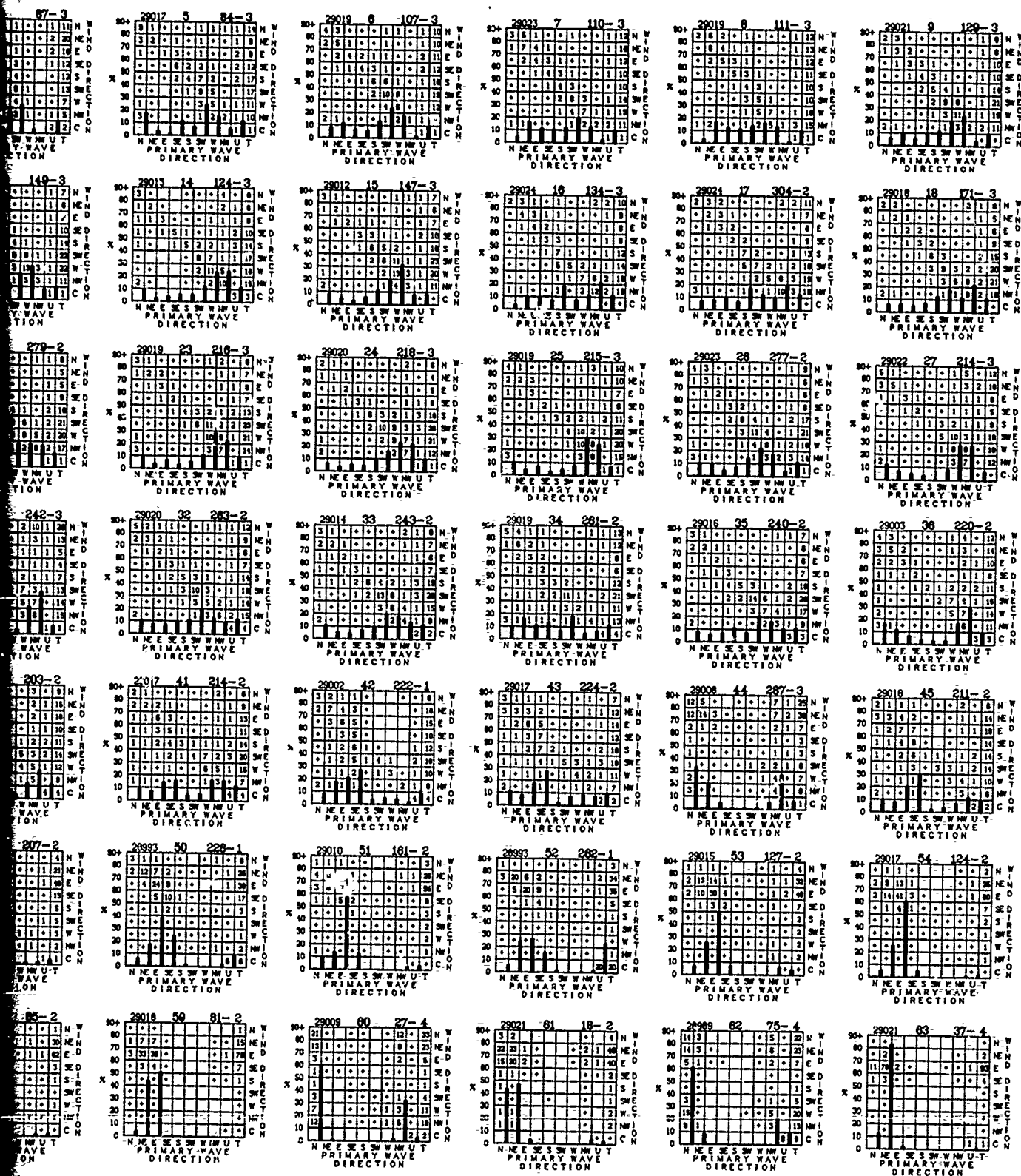


# ANNUAL

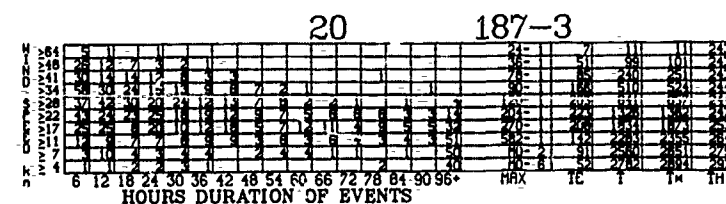
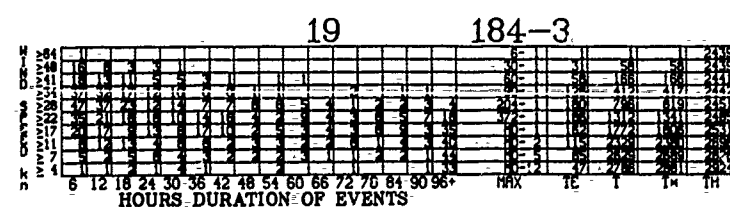
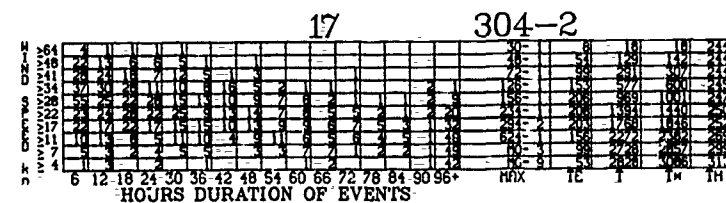
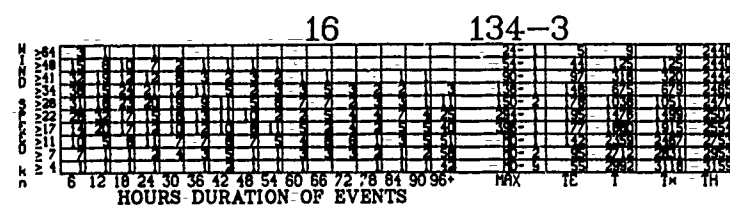
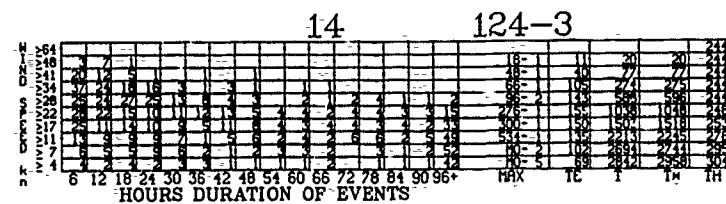
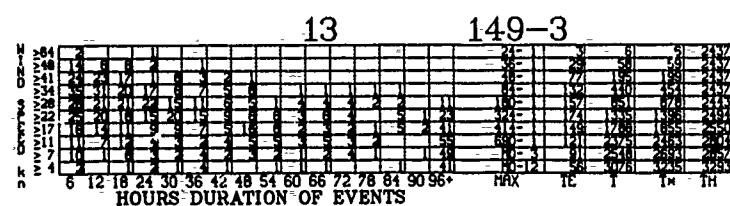
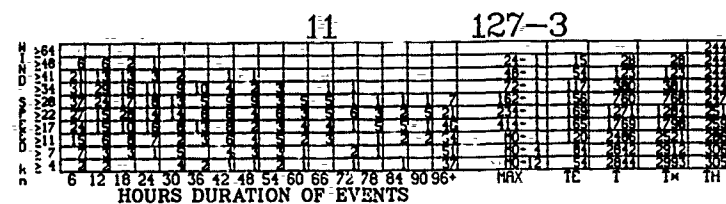
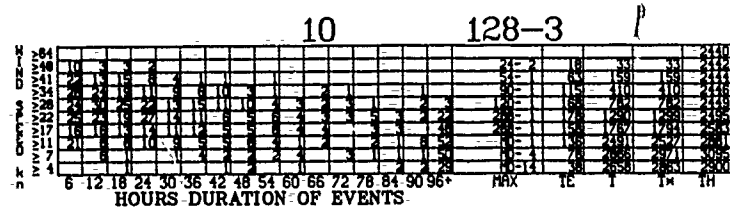
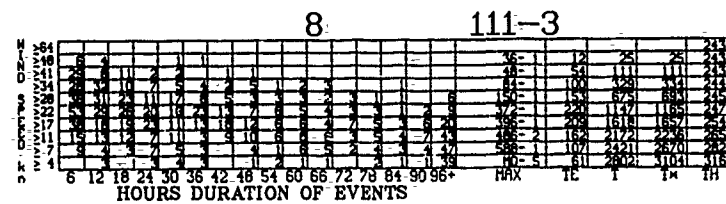
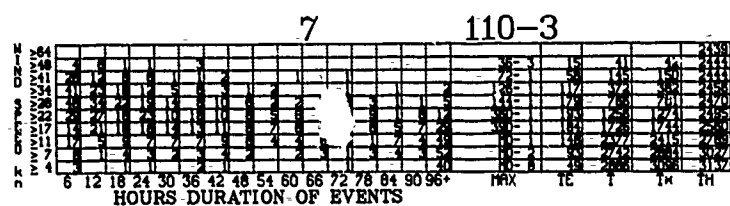
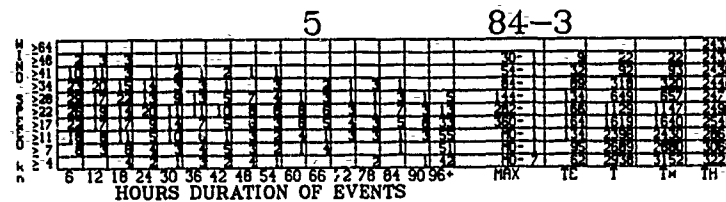
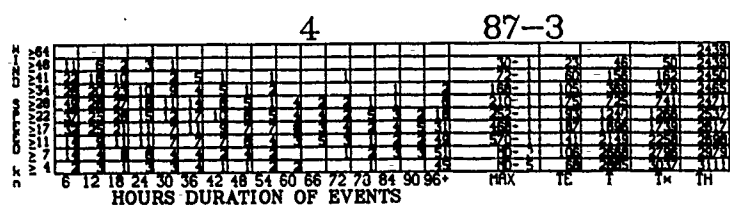
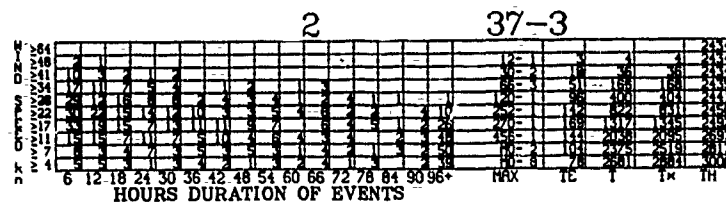
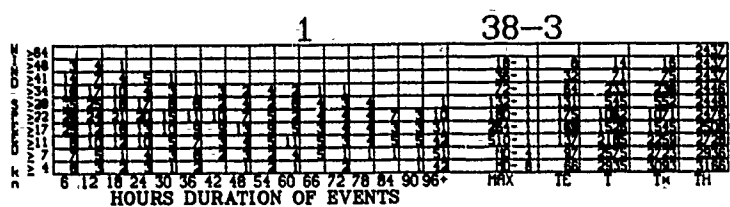
# PRIMARY WAVE DIRECTION



# PRIMARY WAVE DIRECTION AND WIND DIRECTION

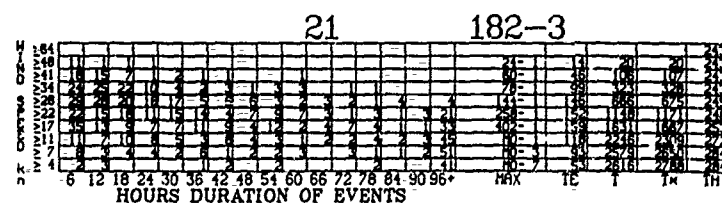
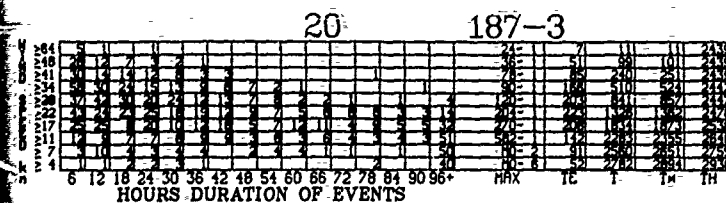
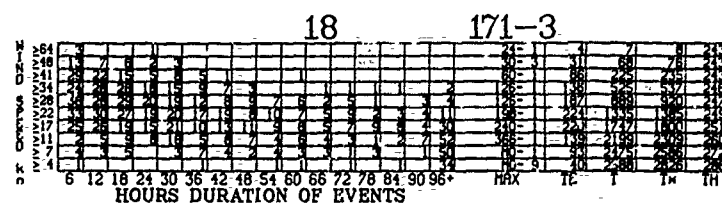
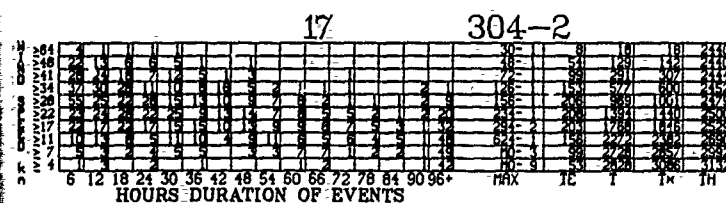
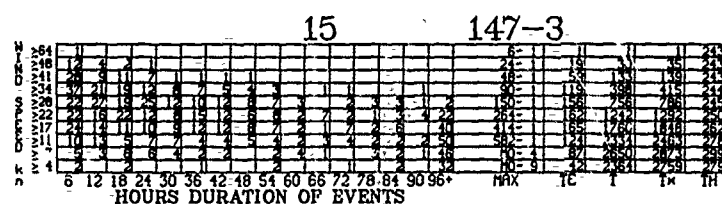
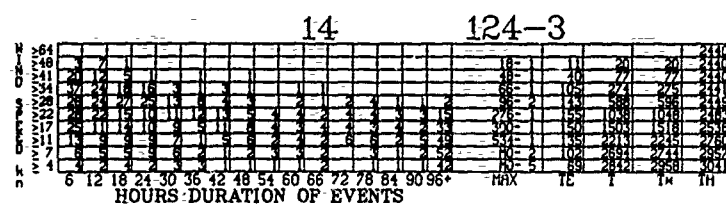
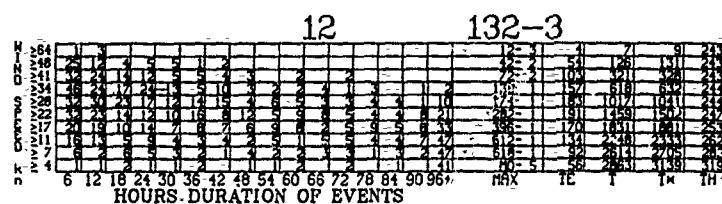
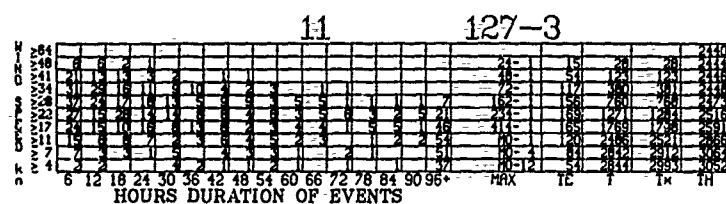
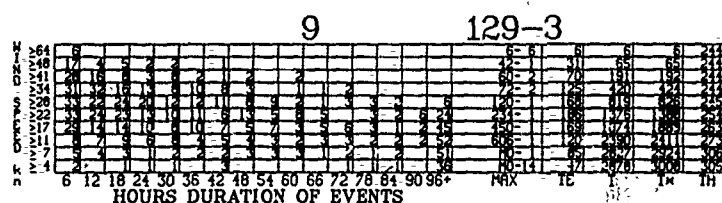
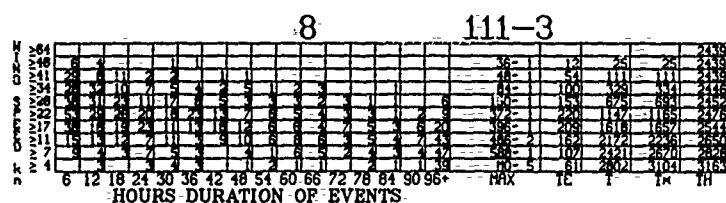
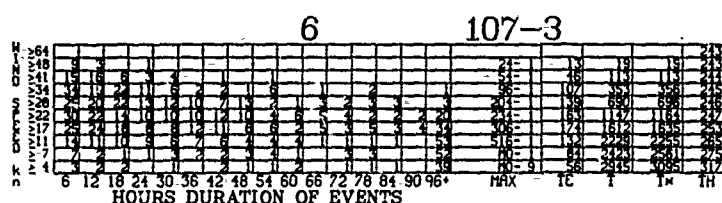
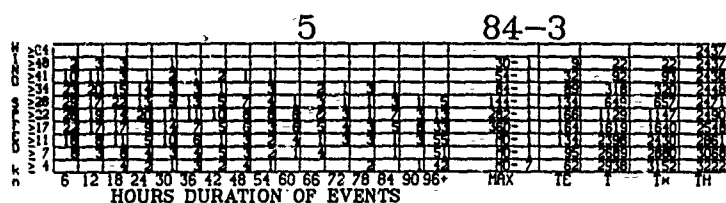
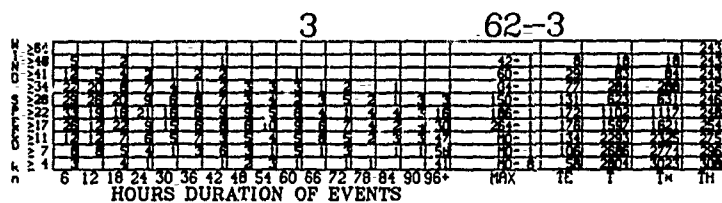
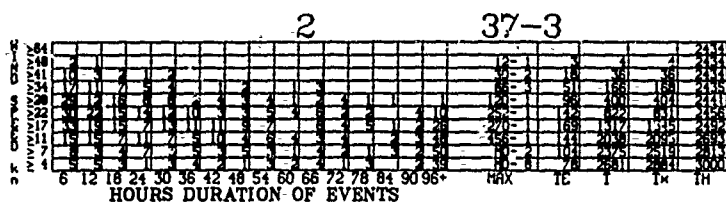


# WIND SPEED DURATIONS





# JANUARY



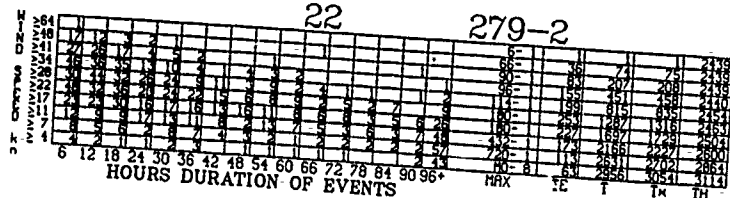
(2)

# JANUARY

WIN

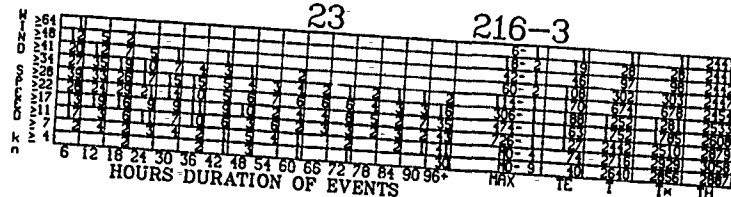
22

279-2



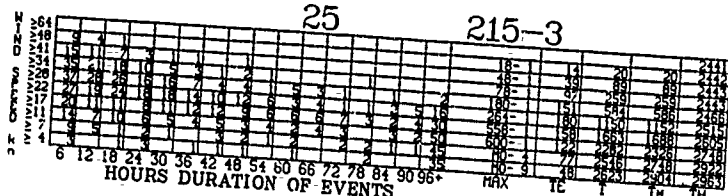
23

216-3



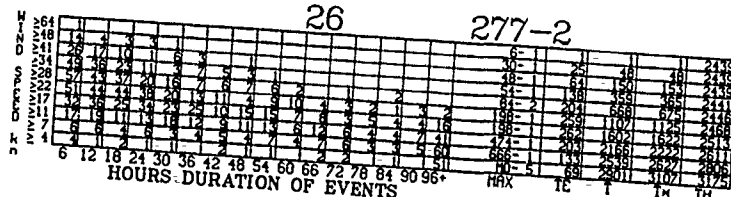
25

215-3



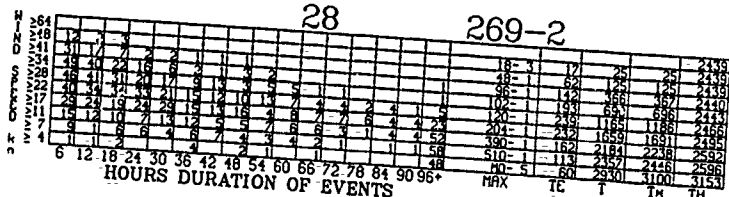
26

277-2



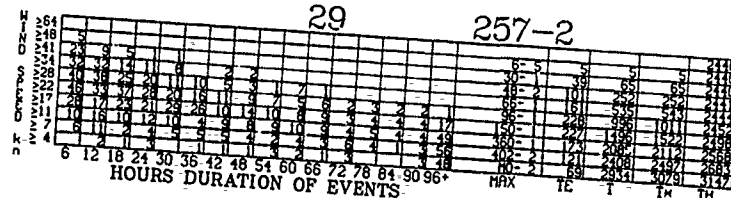
28

269-2



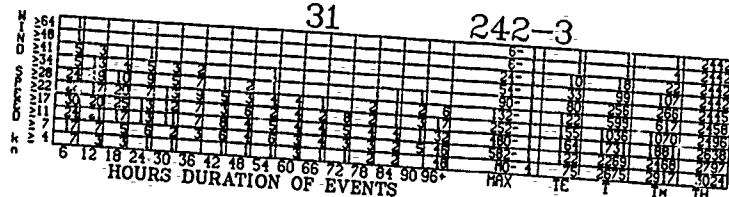
29

257-2



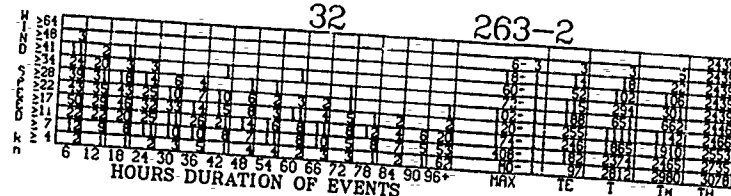
31

242-3



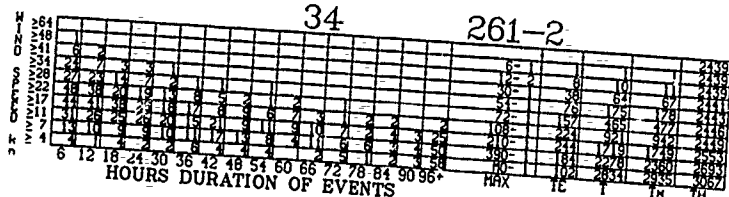
32

263-2



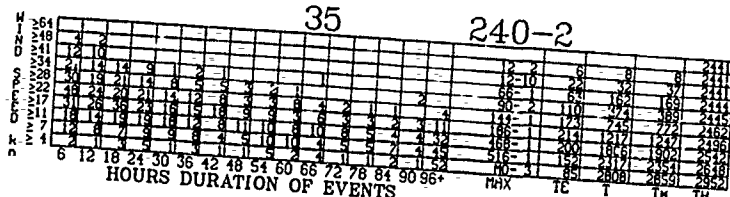
34

261-2



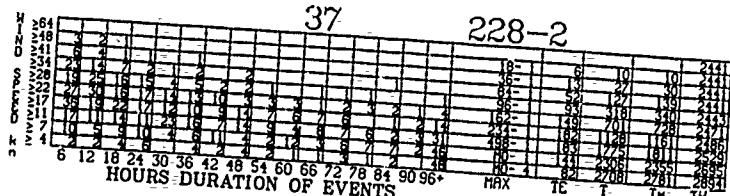
35

240-2



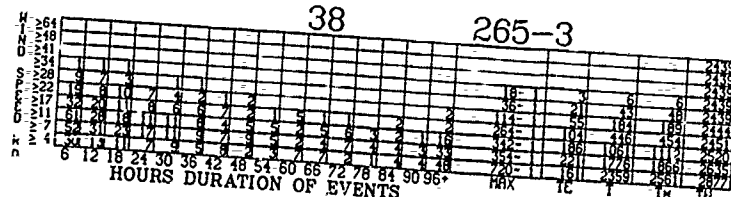
37

228-2



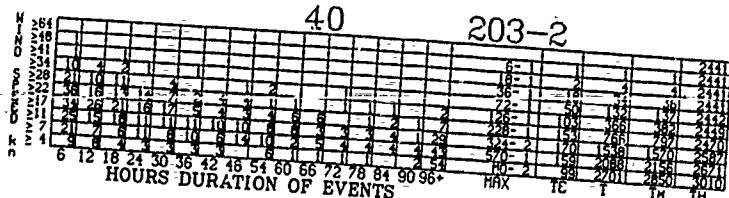
38

265-3



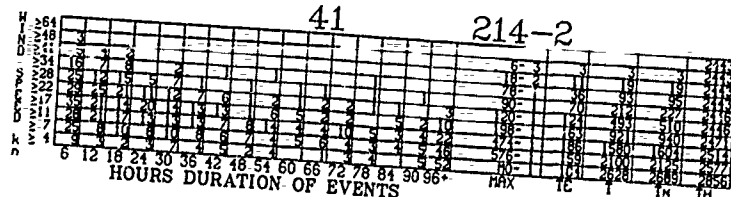
40

203-2



41

214-2

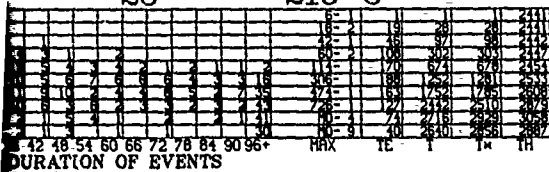




# WIND SPEED DURATIONS (Cont'd)

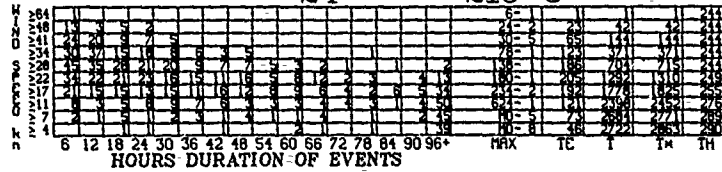
23

216-3



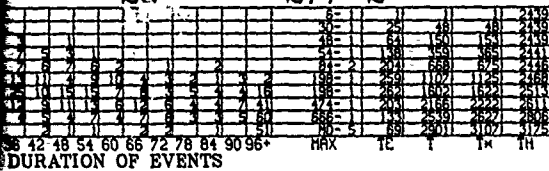
24

218-3



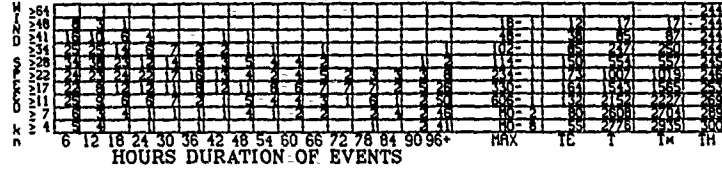
26

277-2



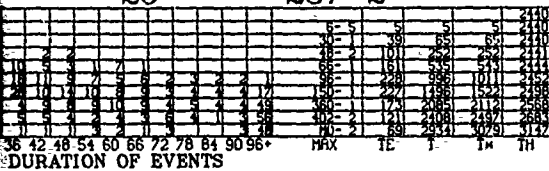
27

214-3



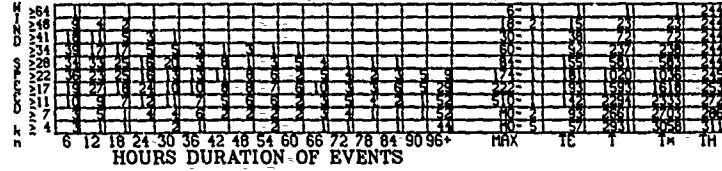
29

257-2



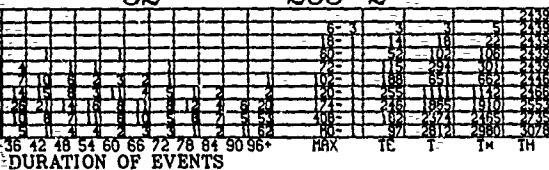
30

247-2



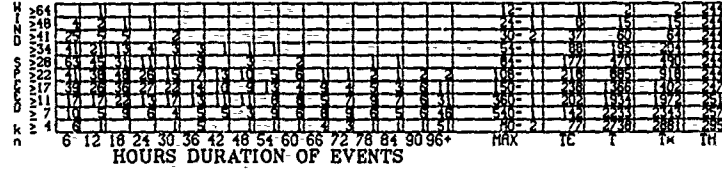
32

263-2



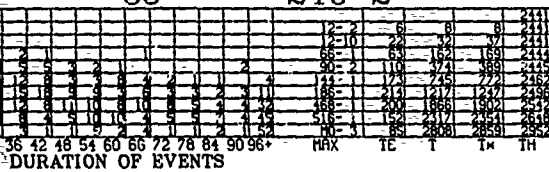
33

243-2



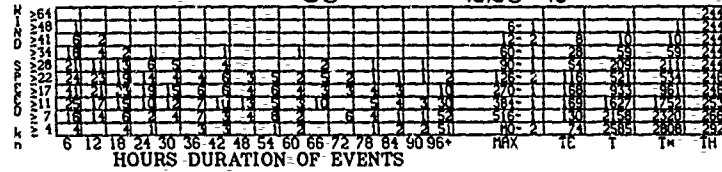
35

240-2



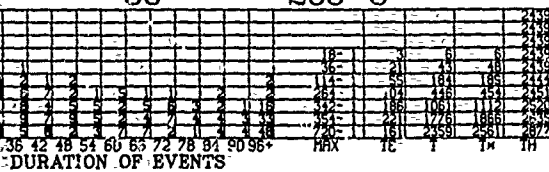
36

220-2



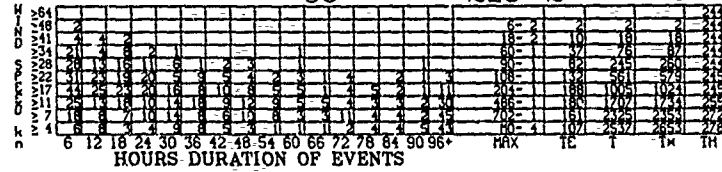
38

265-3



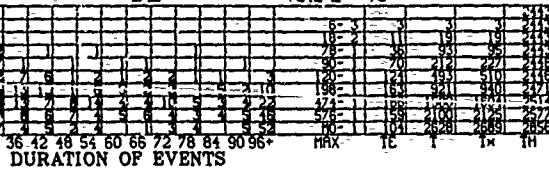
39

216-2



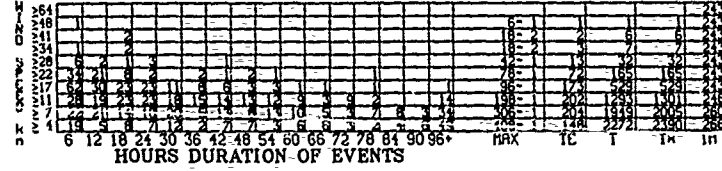
41

214-2

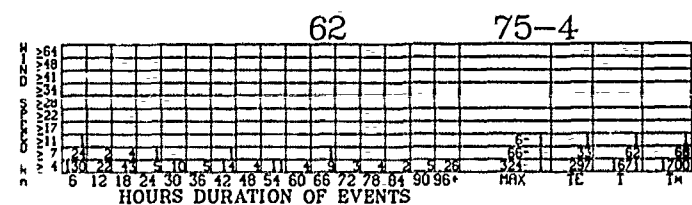
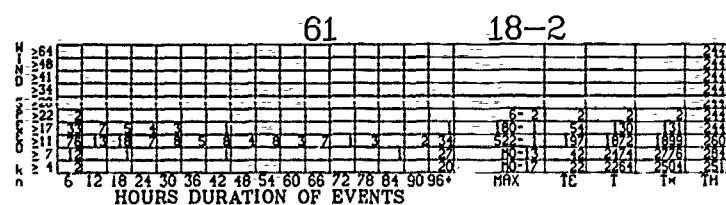
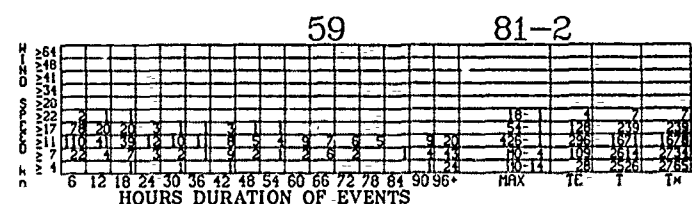
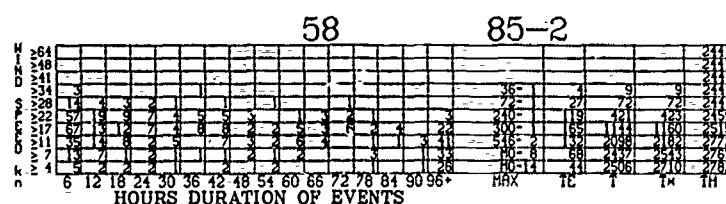
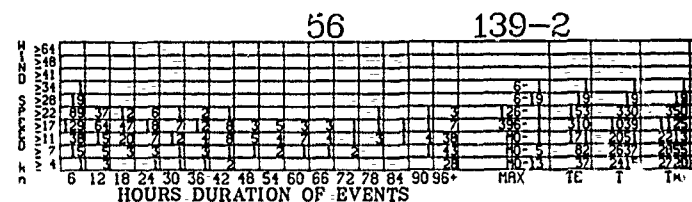
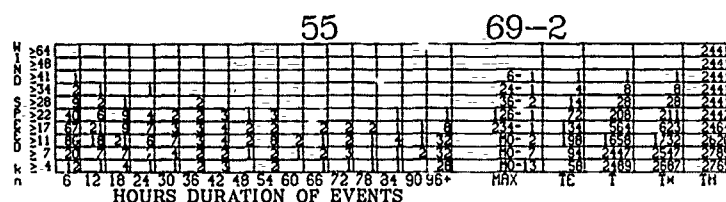
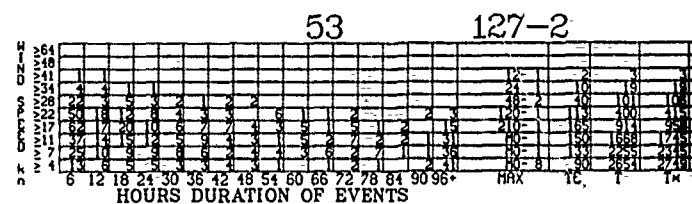
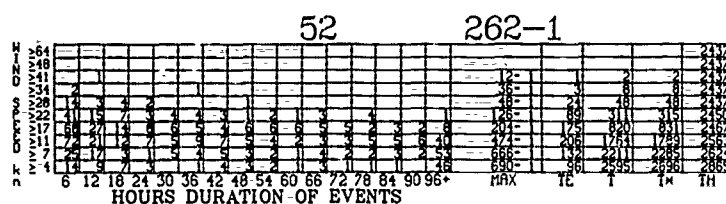
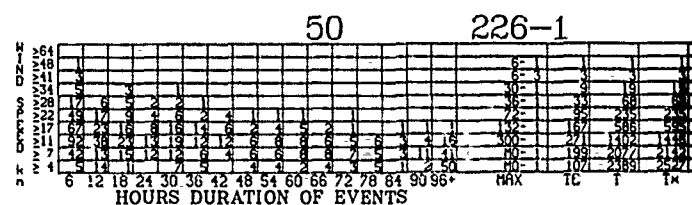
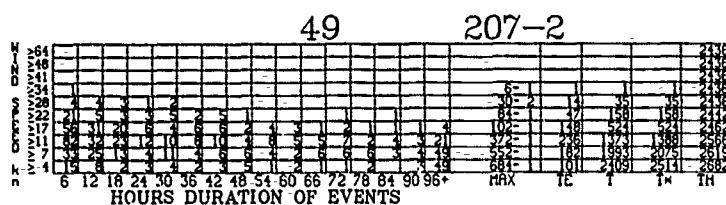
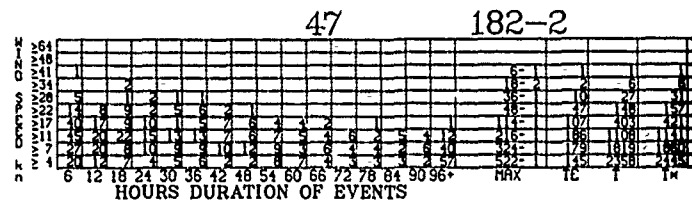
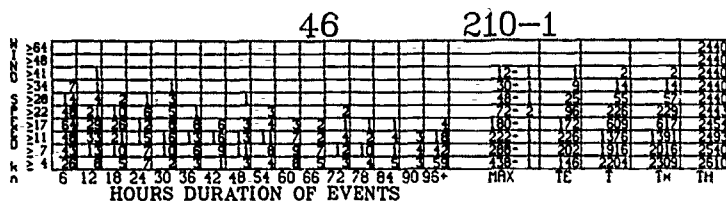
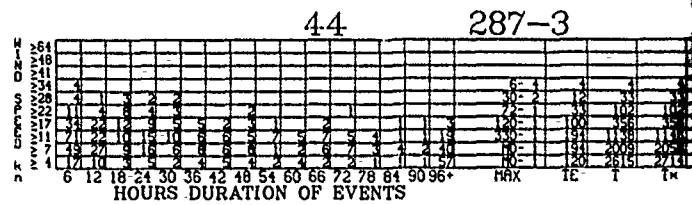
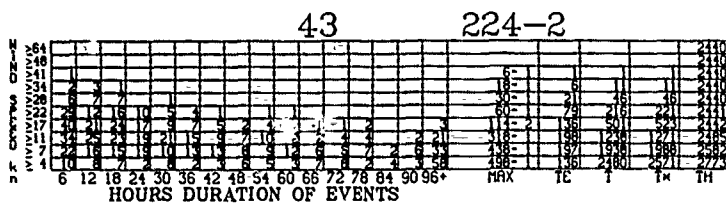


42

222-1

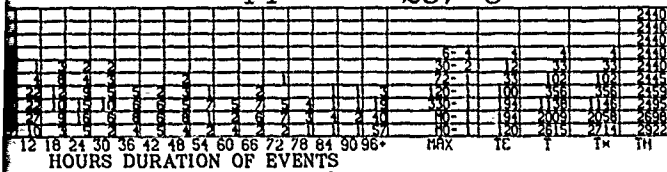


# WIND SPEED DURATIONS (Cont'd)

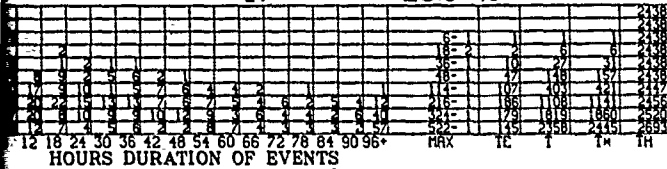


# JANUARY

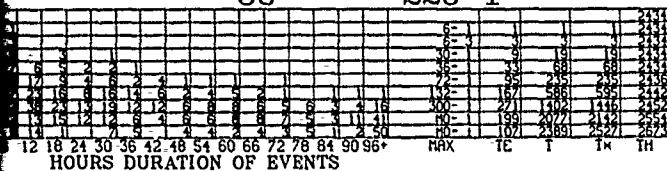
44 287-3



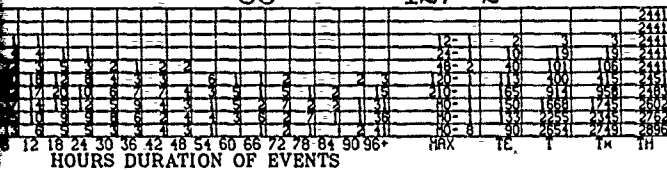
47 182-2



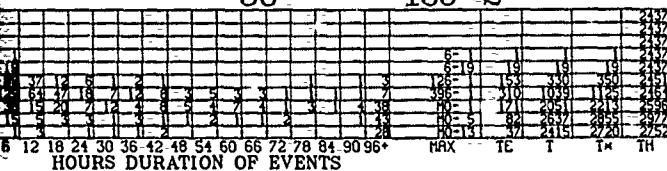
50 226-1



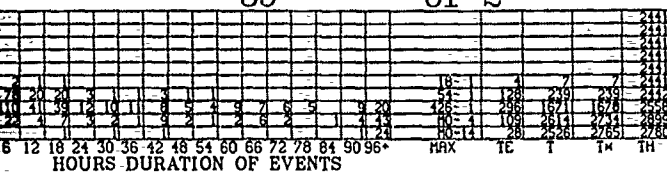
53 127-2



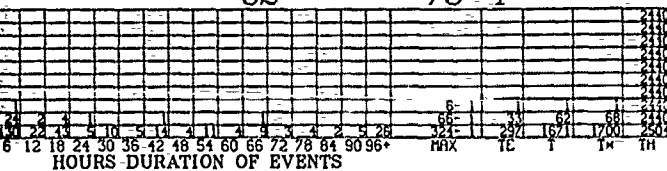
56 139-2



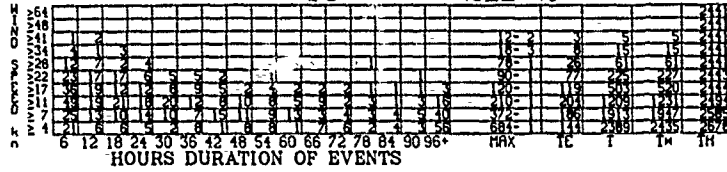
59 81-2



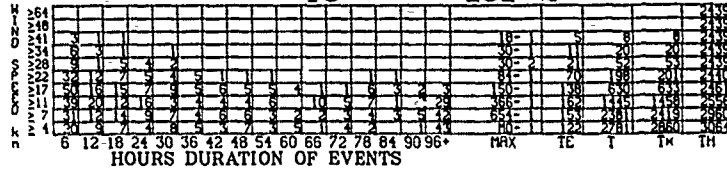
62 75-4



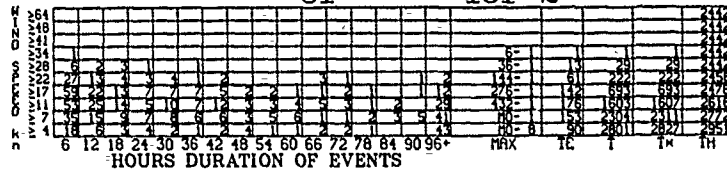
45 211-2



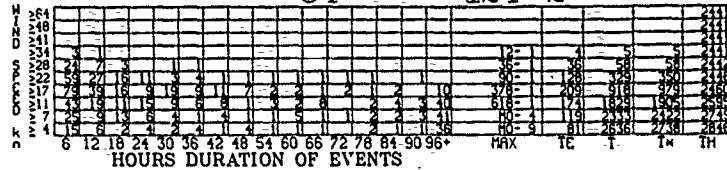
48 151-2



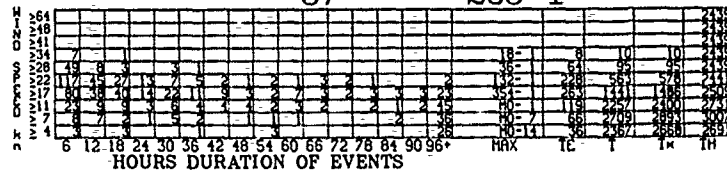
51 161-2



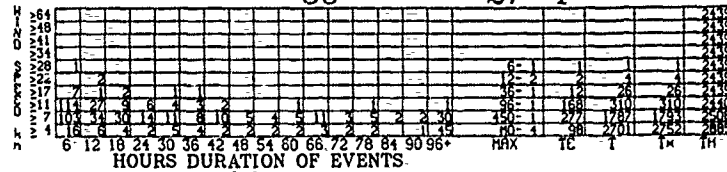
54 124-2



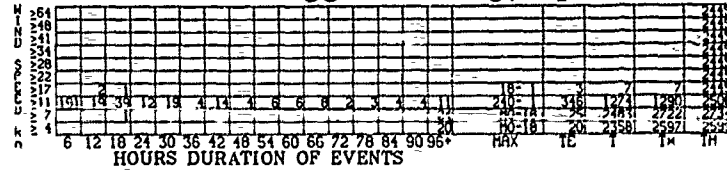
57 283-1



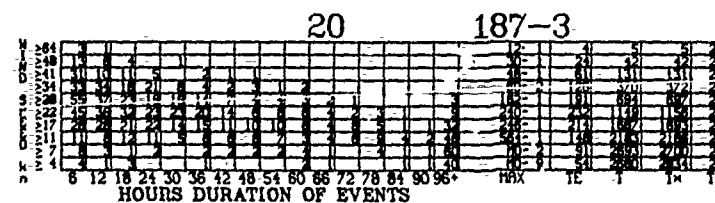
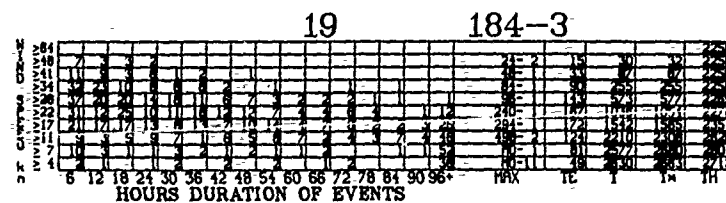
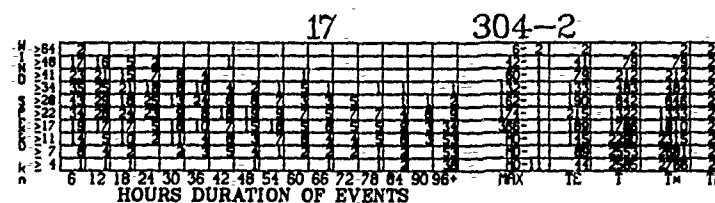
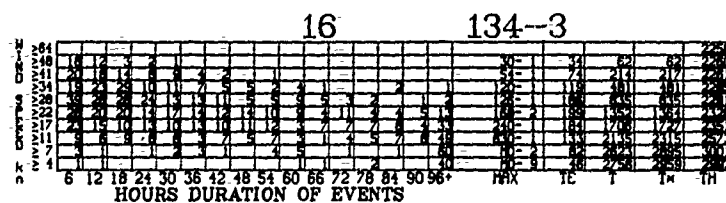
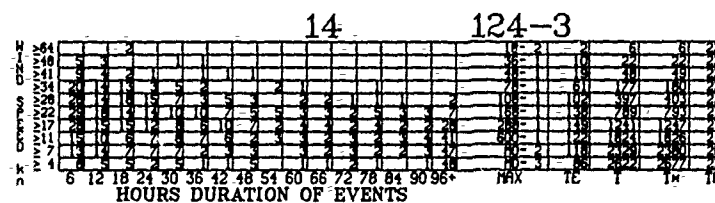
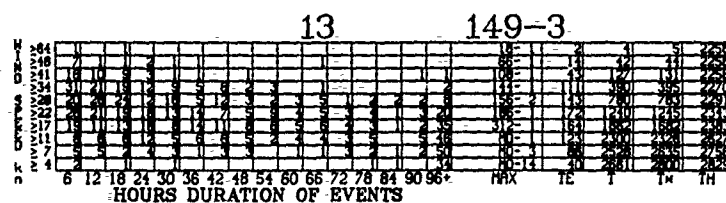
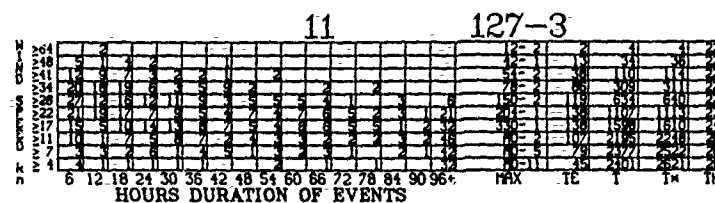
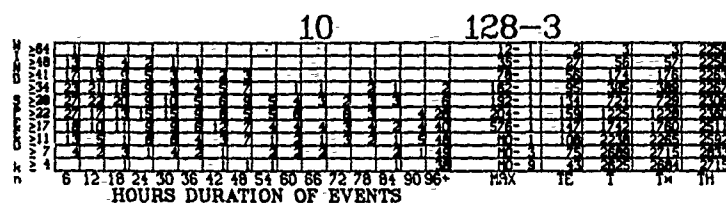
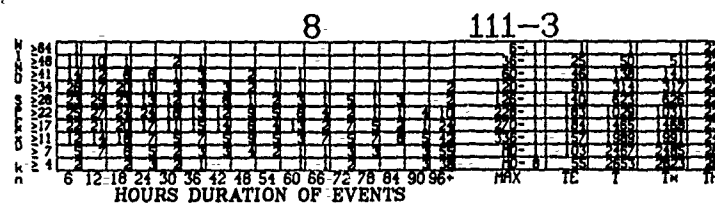
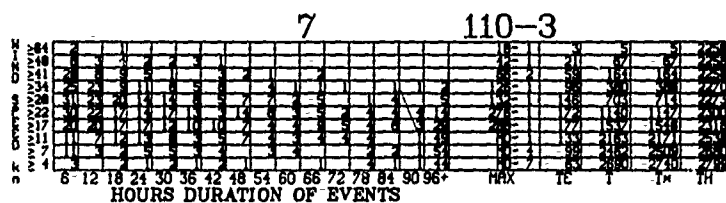
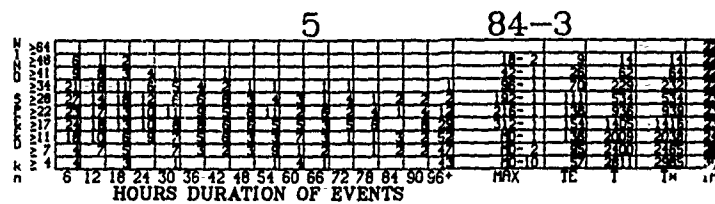
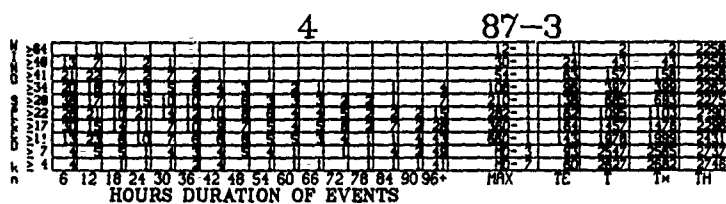
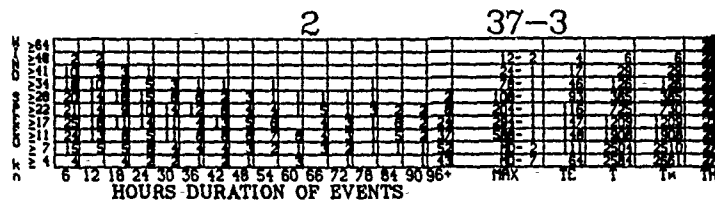
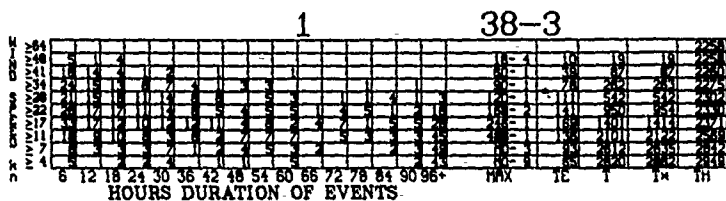
60 27-4



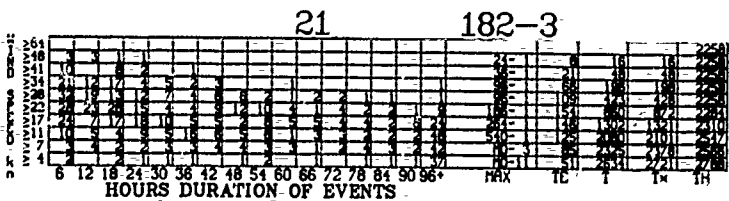
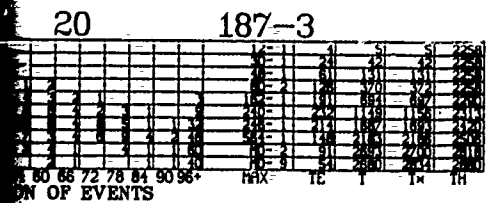
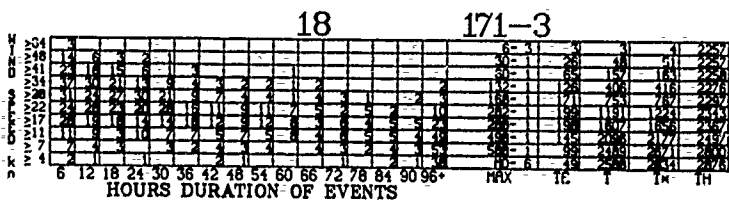
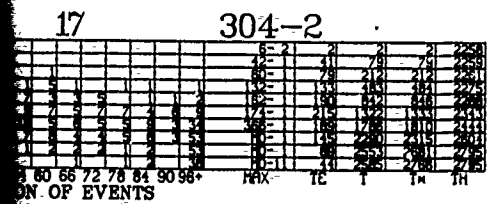
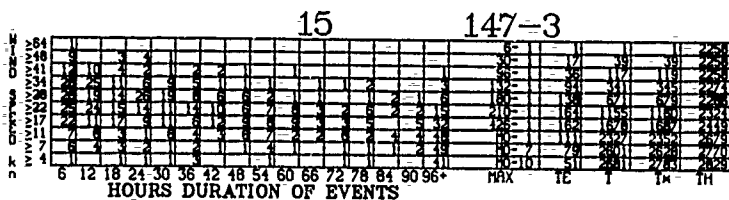
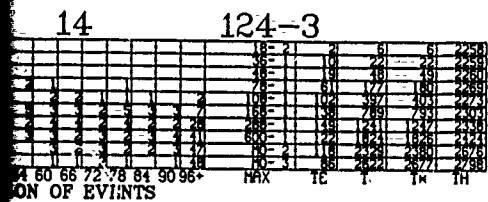
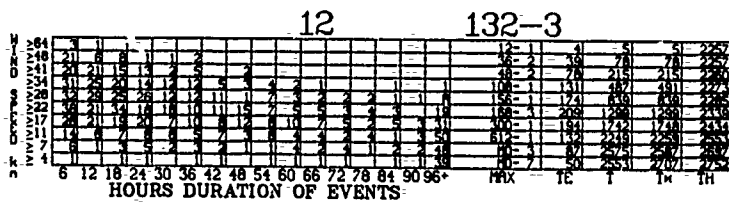
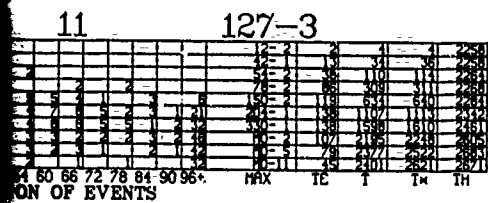
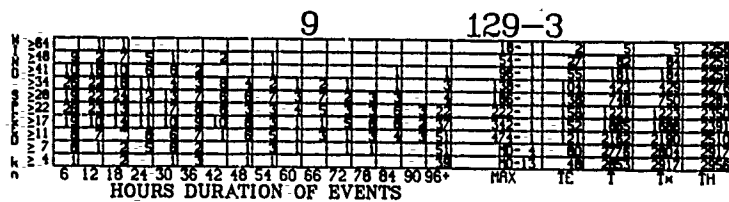
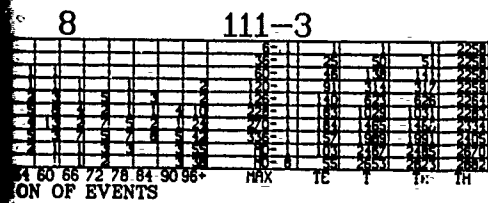
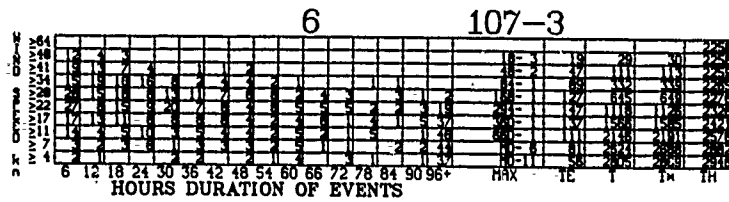
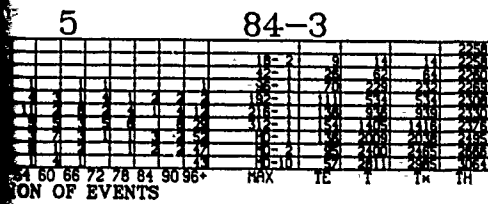
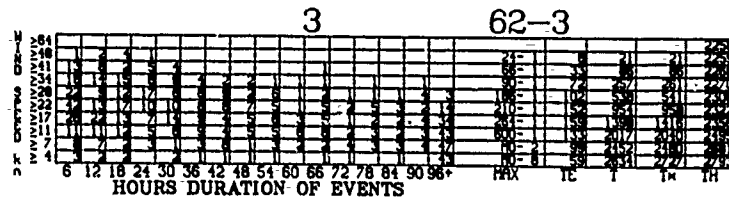
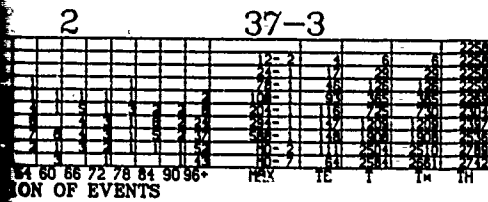
63 37-4



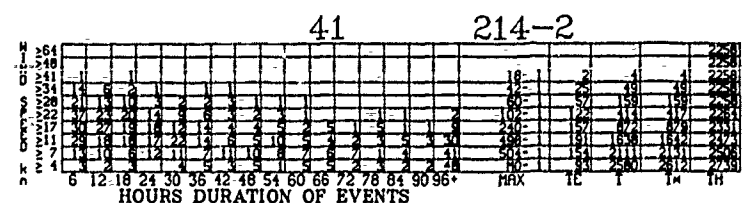
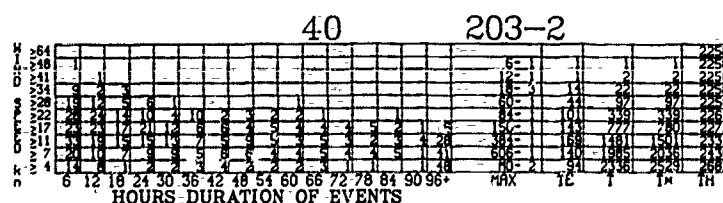
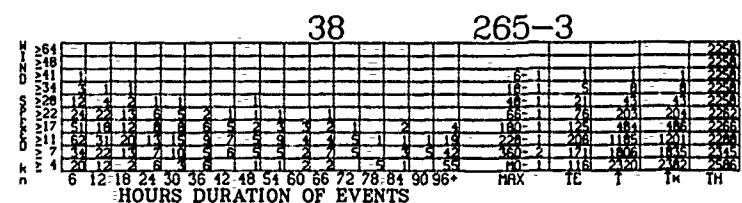
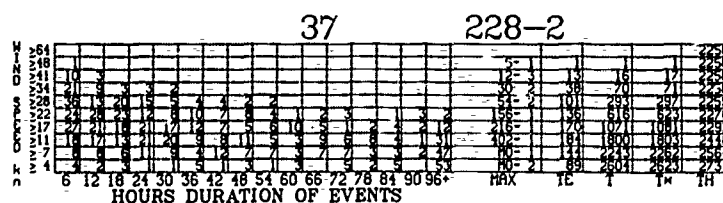
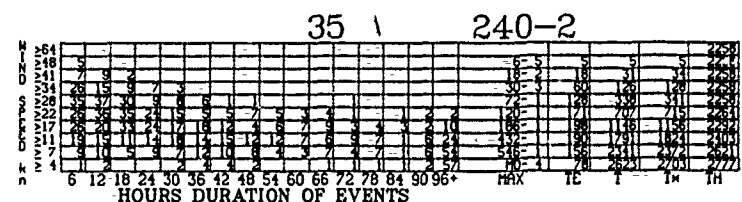
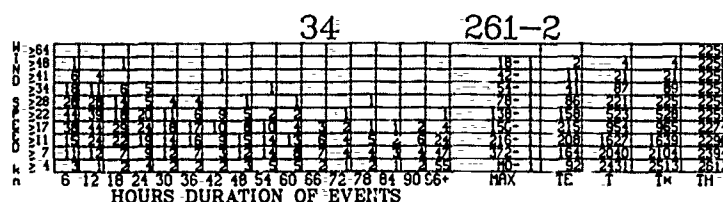
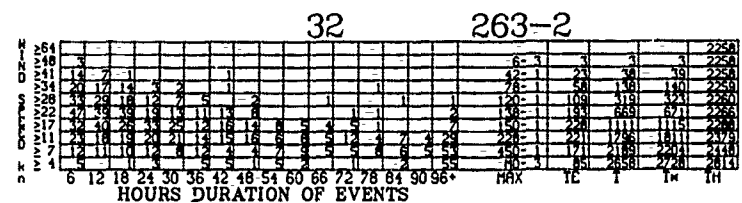
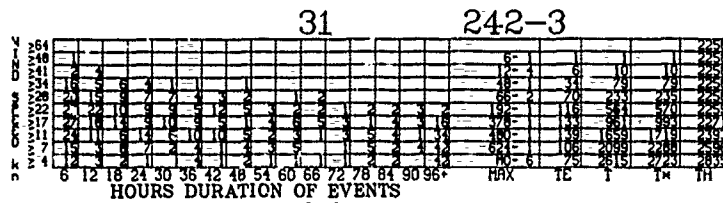
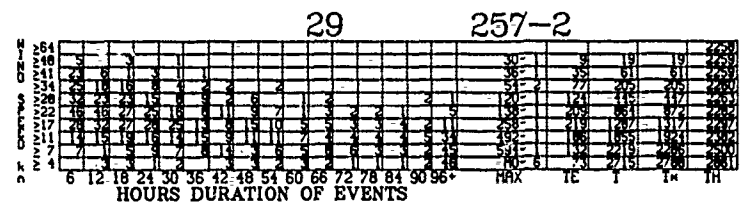
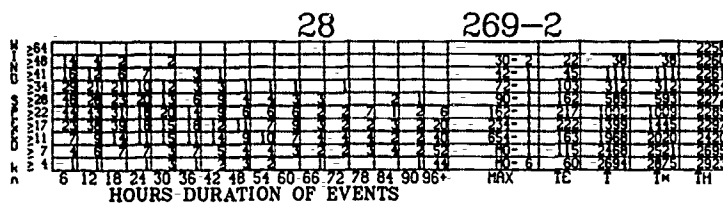
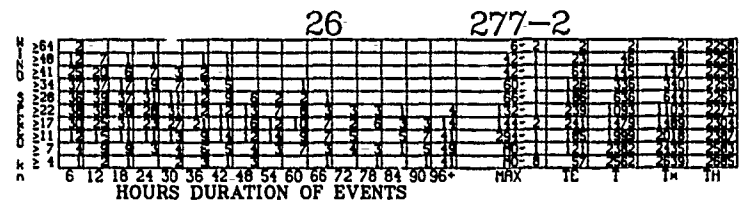
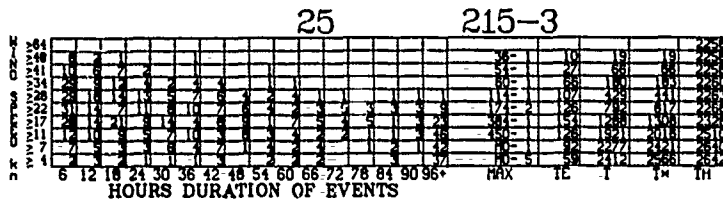
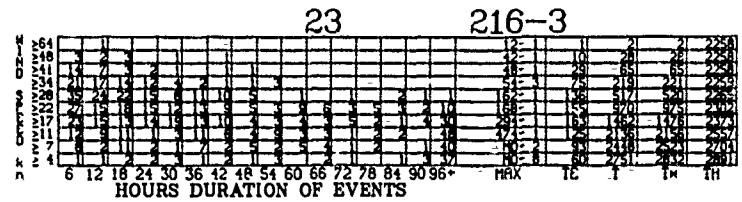
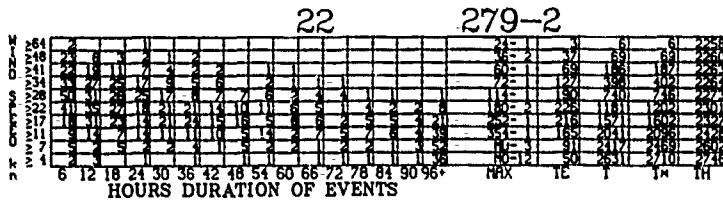
# FEBRUARY



# WIND SPEED DURATIONS



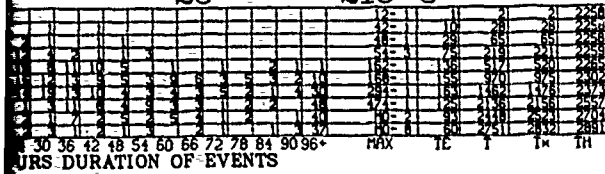
# WIND SPEED DURATIONS (Cont'd)



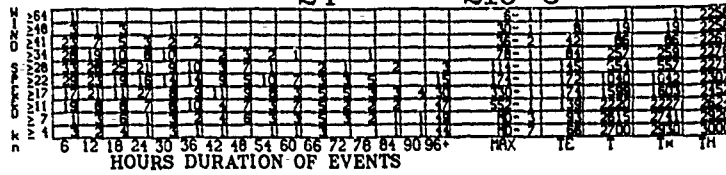


# FEBRUARY

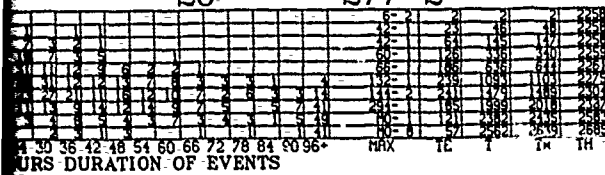
23 216-3



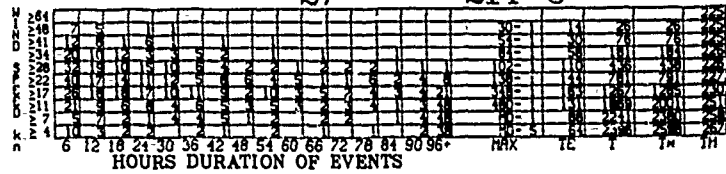
24 218-3



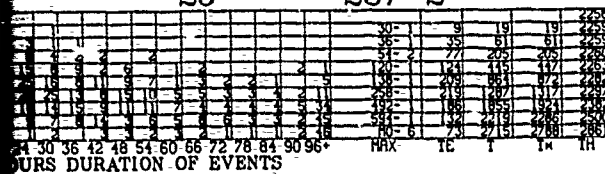
26 277-2



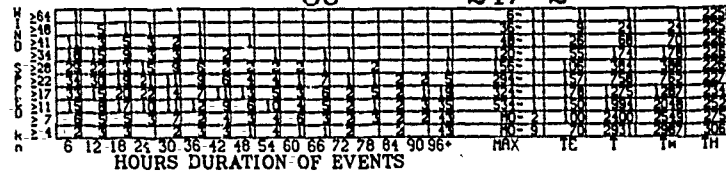
27 214-3



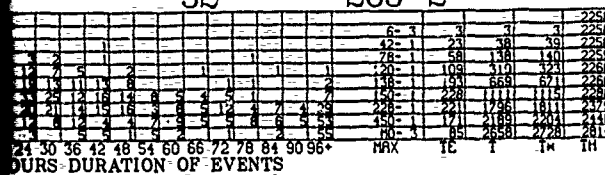
29 257-2



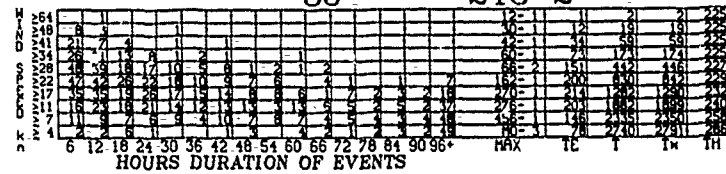
30 247-2



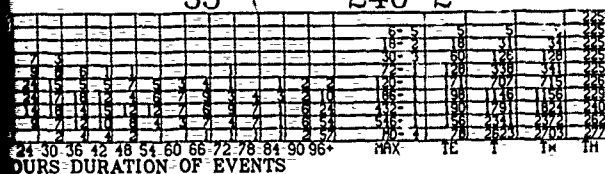
32 263-2



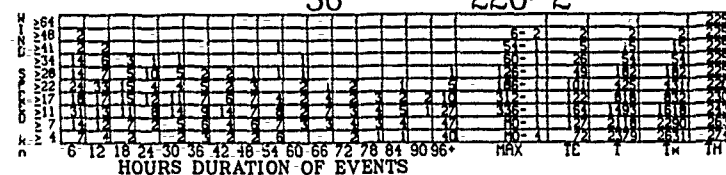
33 243-2



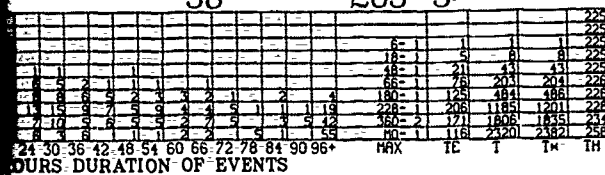
35 240-2



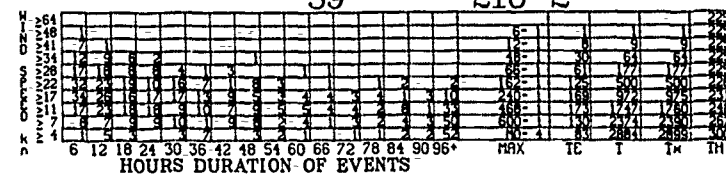
36 220-2



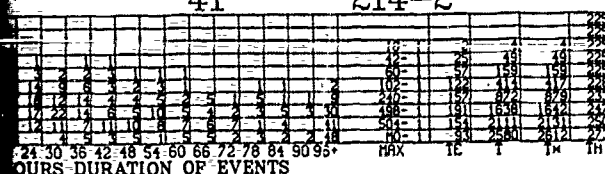
38 265-3



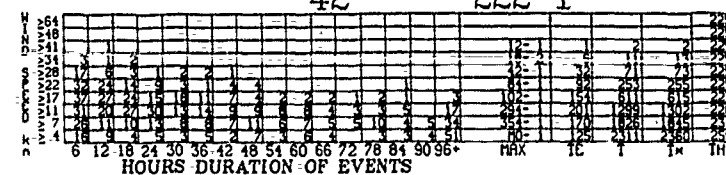
39 216-2



41 214-2



42 222-1

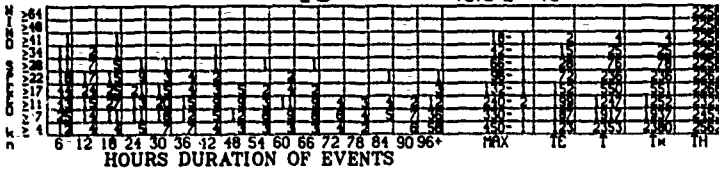




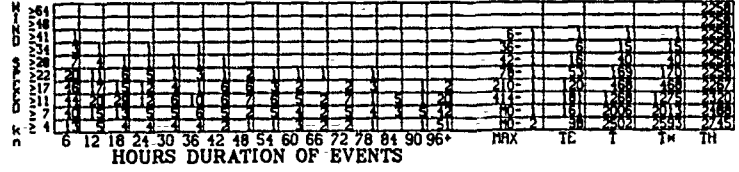
# FEBRUARY

WIN

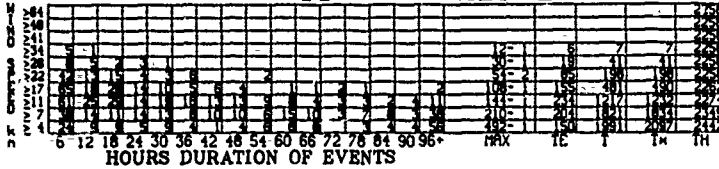
43 224-2



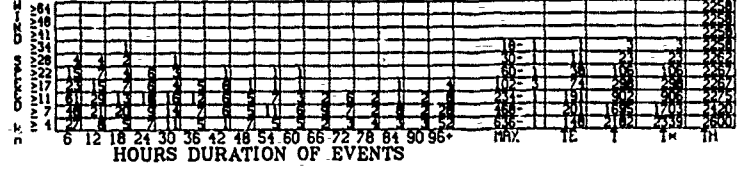
44 287-3



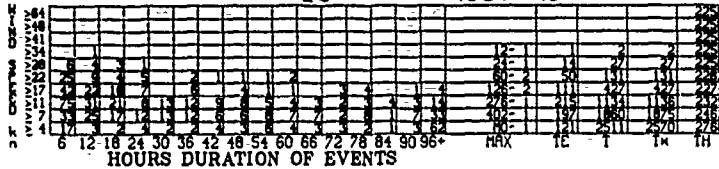
46 210-1



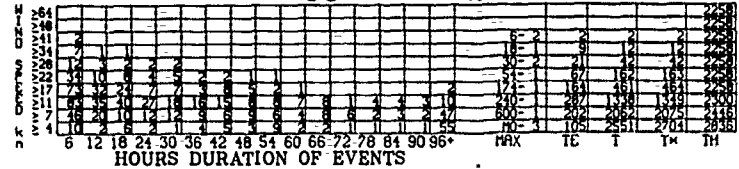
47 182-2



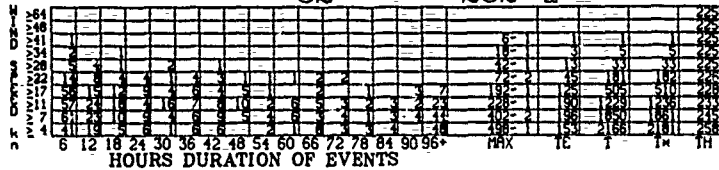
49 207-2



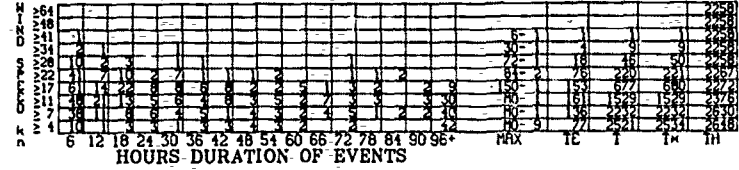
50 226-1



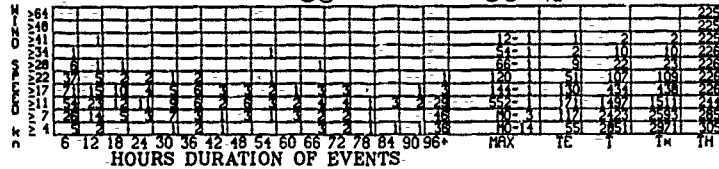
52 262-1



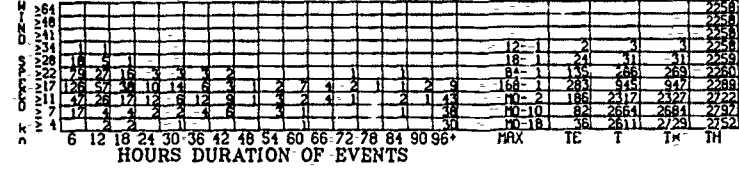
53 127-2



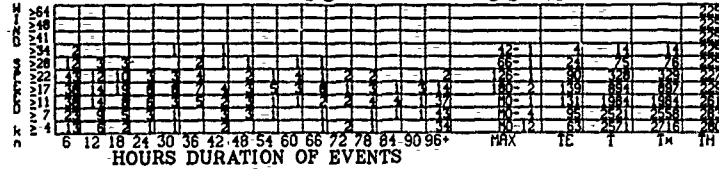
55 69-2



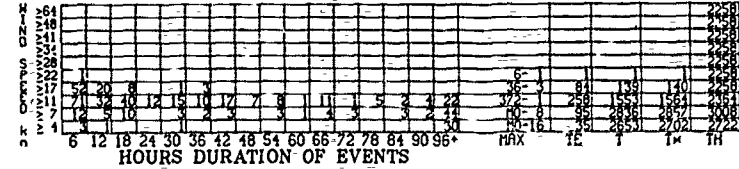
56 139-2



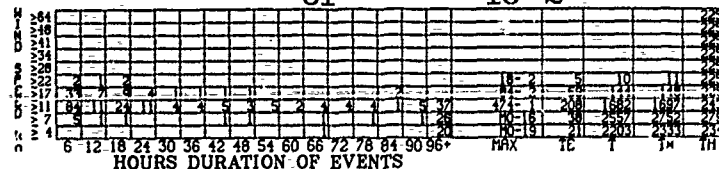
58 85-2



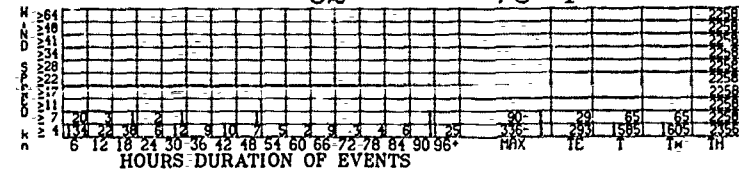
59 81-2



61 18-2

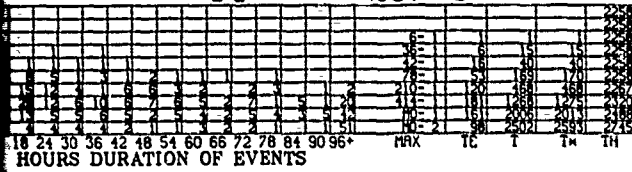


62 75-4

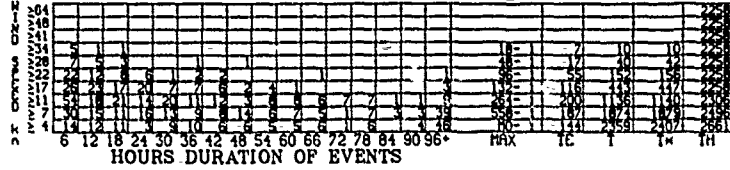


# WIND SPEED DURATIONS (Cont'd)

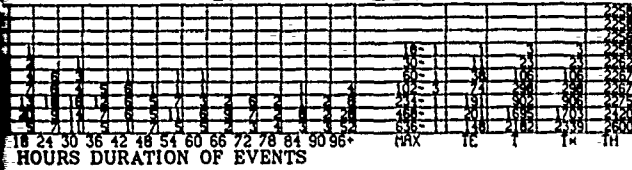
44 287-3



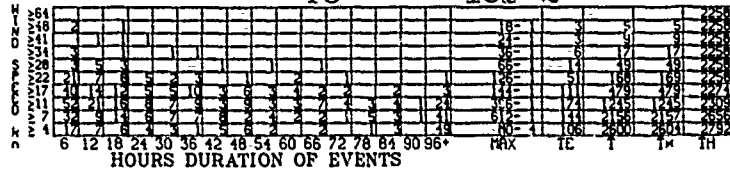
45 211-2



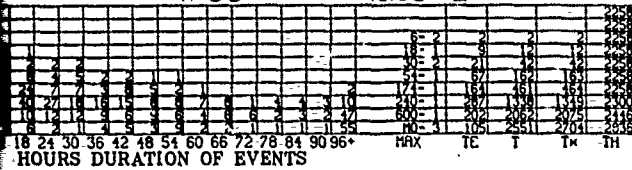
47 182-2



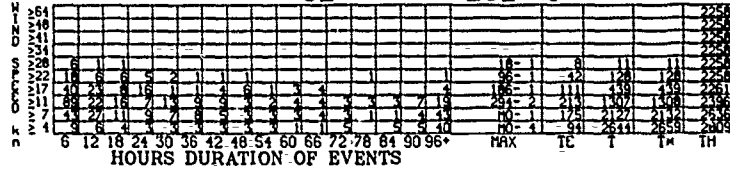
48 151-2



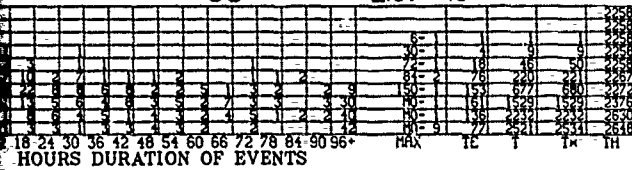
50 226-1



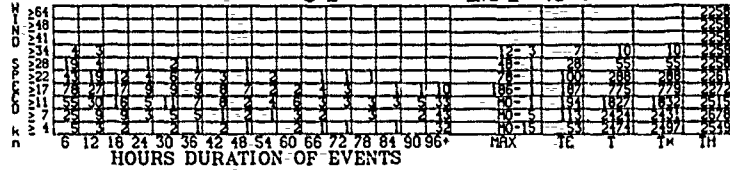
51 161-2



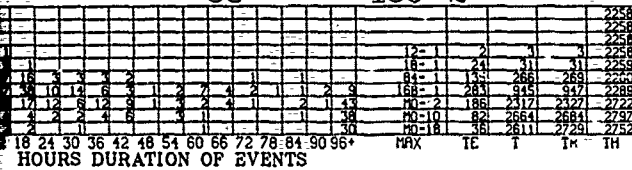
53 127-2



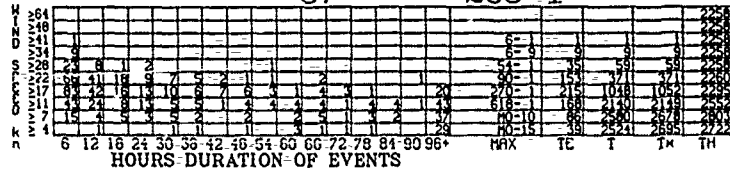
54 124-2



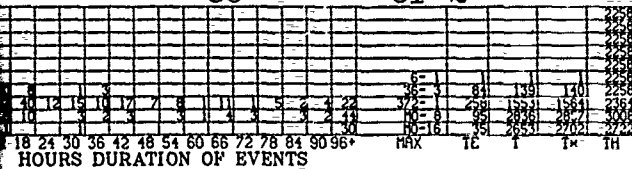
56 139-2



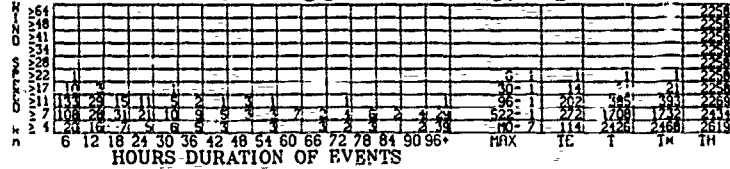
57 283-1



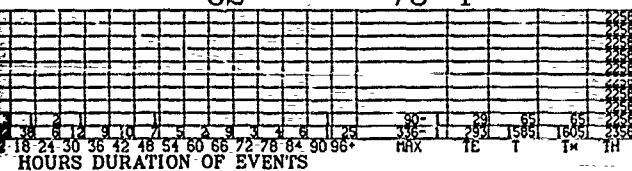
59 81-2



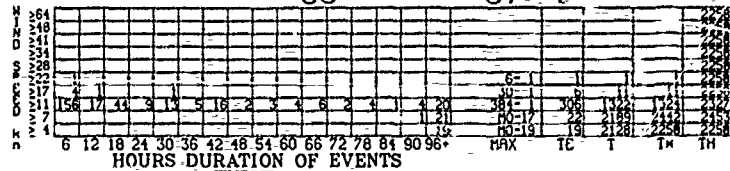
60 27-4



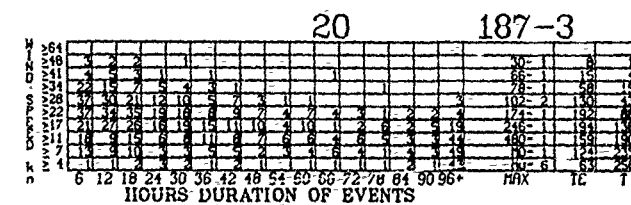
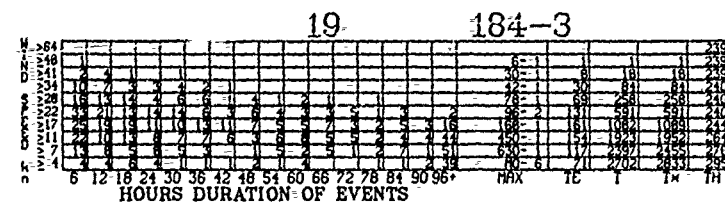
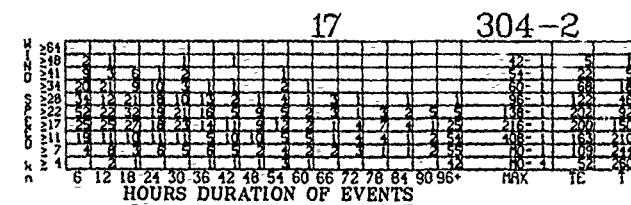
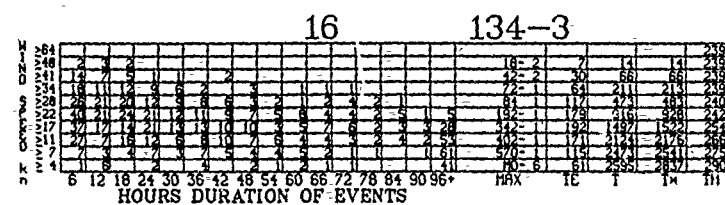
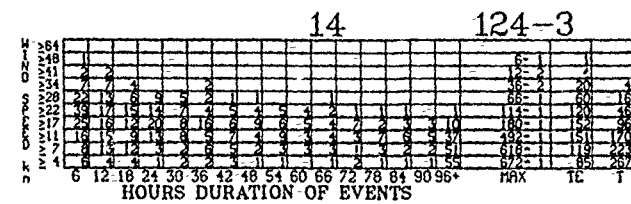
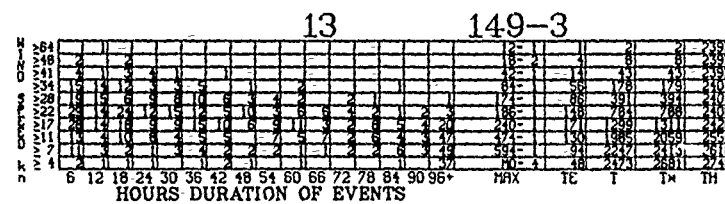
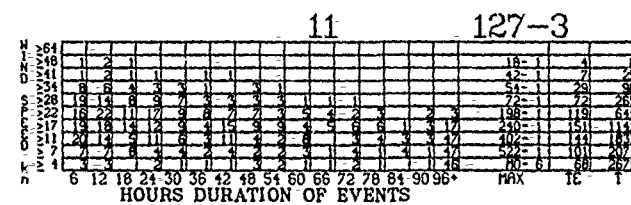
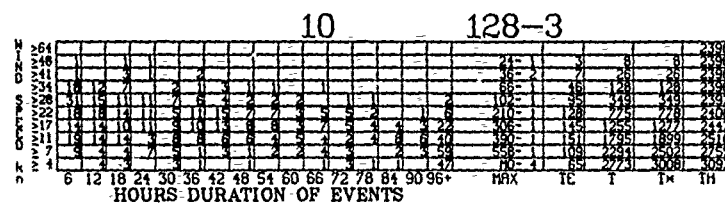
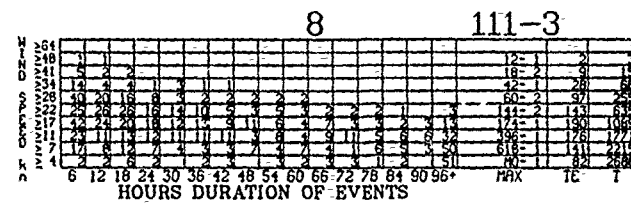
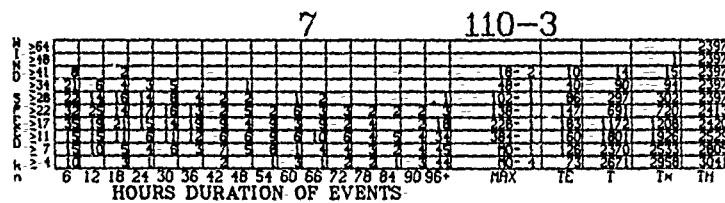
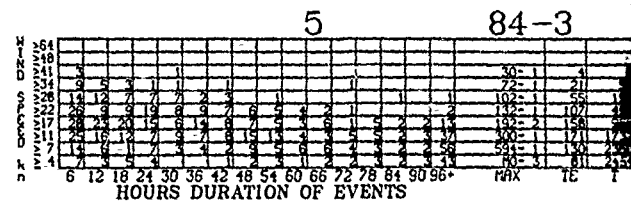
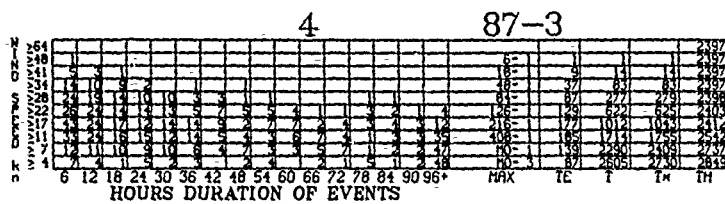
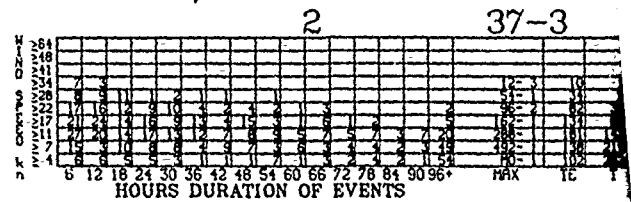
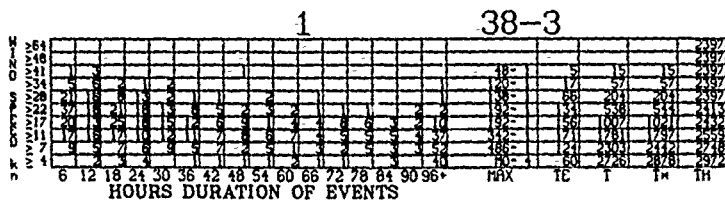
62 75-4



63 37-4



# WIND SPEED DURATIONS



①

APRIL

[illegible][illegible][illegible][illegible][illegible][illegible]

11											127-3									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	2	1	1	1	1	1	1	1	1	1	18	1	4	8	8	8	8	8	8	2396
2	1	1	1	1	1	1	1	1	1	1	42	1	26	26	26	26	26	26	26	2396
3	1	1	1	1	1	1	1	1	1	1	72	1	26	26	26	26	26	26	26	2396
4	1	1	1	1	1	1	1	1	1	1	158	1	119	645	650	2401				2396
5	1	1	1	1	1	1	1	1	1	1	240	1	151	1142	1145	2445				2396
6	1	1	1	1	1	1	1	1	1	1	305	1	101	1471	1580	3022				2396
7	1	1	1	1	1	1	1	1	1	1	NO	6	58	2575	2521	3022				2396
8	1	1	1	1	1	1	1	1	1	1										2396
9	1	1	1	1	1	1	1	1	1	1										2396
10	1	1	1	1	1	1	1	1	1	1										2396
11	1	1	1	1	1	1	1	1	1	1										2396
12	1	1	1	1	1	1	1	1	1	1										2396

HOURS DURATION OF EVENTS

12												132-3											
HOURS DURATION OF EVENTS																							
6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96+	HRX	TC	T	T*	TH			
64	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18	1	1	1	1		
60	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	1	1	1	1		
56	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	1	1	1	1		
52	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	9	1	1	1	1		
48	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	6	1	1	1	1		
44	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1		
40	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1		
36	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		
32	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		
28	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		
24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		
8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		

[illegible][illegible]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	MAX	TE	T	TM	TH
HOURS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	MAX	TE	T	TM	TH
DURATION OF EVENTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	MAX	TE	T	TM	TH

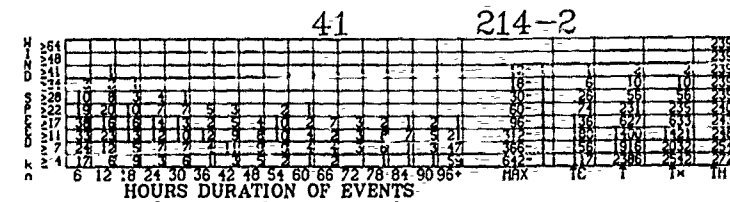
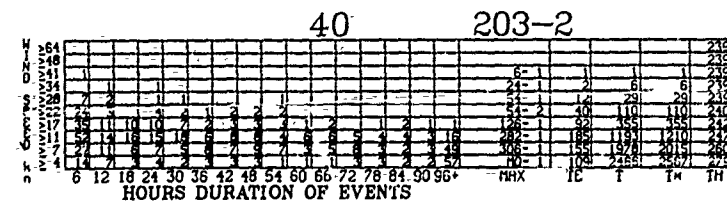
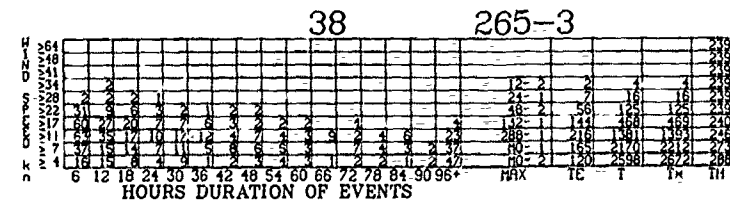
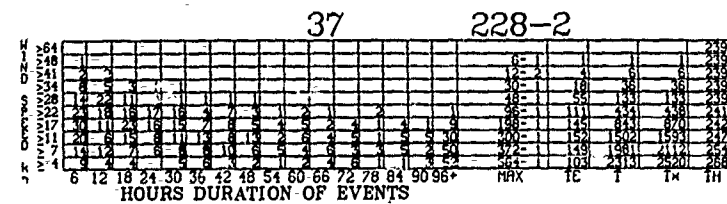
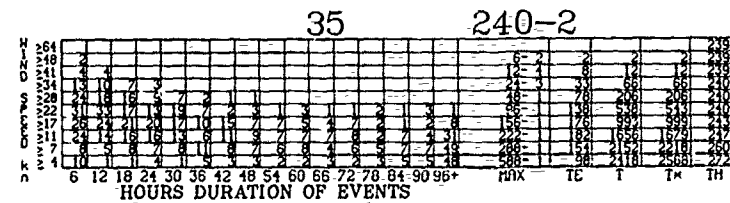
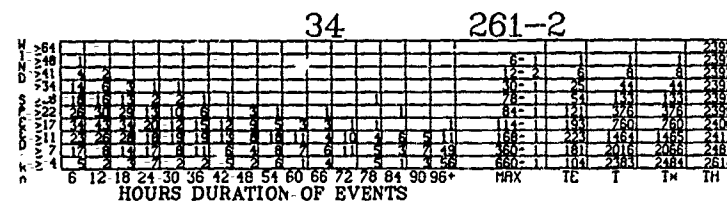
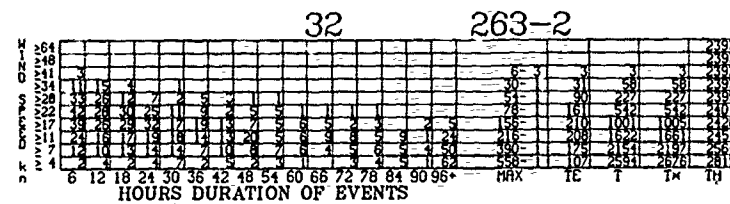
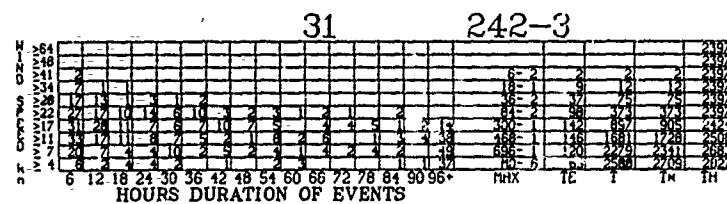
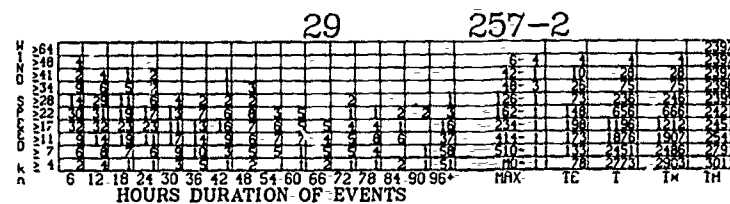
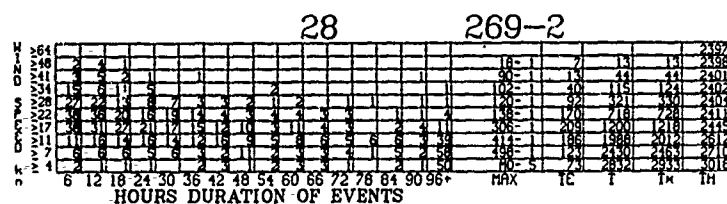
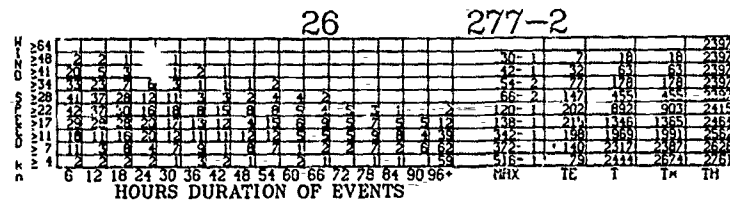
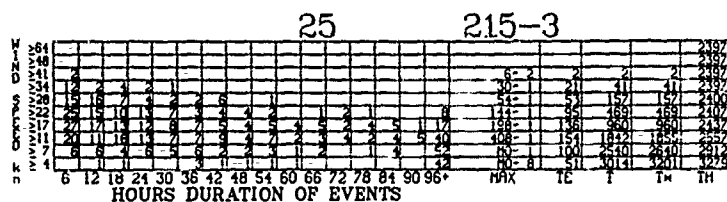
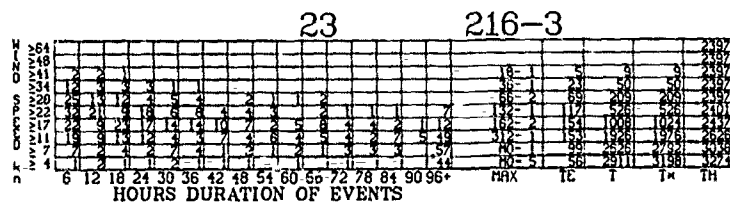
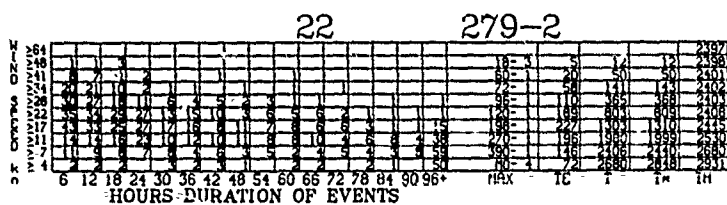
[illegible]

20															187-3																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
2	2	2														20	1	8	18	18									2187			
3	2	2														56	1	1	14	14										2187		
4	2	15	2	5	4	1	2	1	1	1	1	1	1	1	1	102	2	130	430	235	236									2187		
5	2	20	12	10	2	2	3	1	1	1	1	1	1	1	1	174	1	192	887	904	245									2187		
6	2	27	26	18	16	8	9	7	4	1	4	3	2	2	2	245	1	194	368	210	212									2187		
7	2	27	26	18	16	8	9	7	4	1	4	3	2	2	2	400	1	124	264	245	245									2187		
8	2	27	26	18	16	8	9	7	4	1	4	3	2	2	2	180	1	1	264	245	245									2187		
9	2	27	26	18	16	8	9	7	4	1	4	3	2	2	2	10	6	64	264	245	245									2187		
10	2	27	26	18	16	8	9	7	4	1	4	3	2	2	2															2187		
11	2	27	26	18	16	8	9	7	4	1	4	3	2	2	2															2187		
12	18	24	33	36	42	48	54	60	66	72	78	84	90	96		MAX	1E	1	1	1	1									2187		
HOURS DURATION OF EVENTS																																

[illegible]

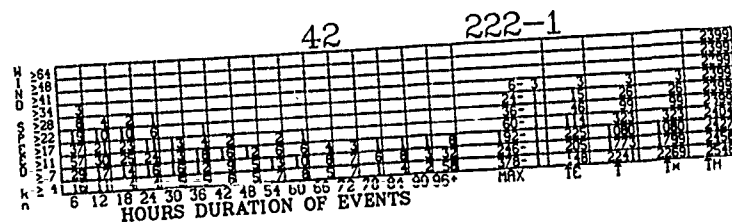
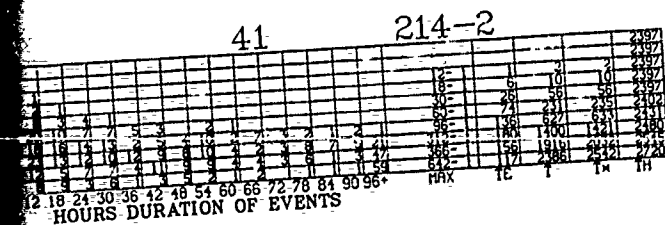
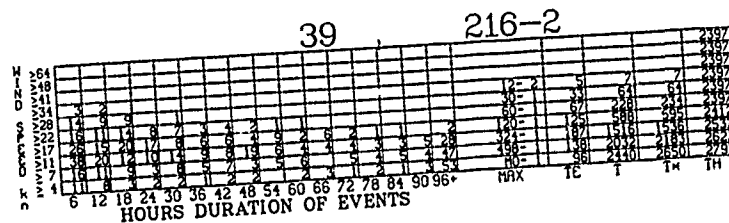
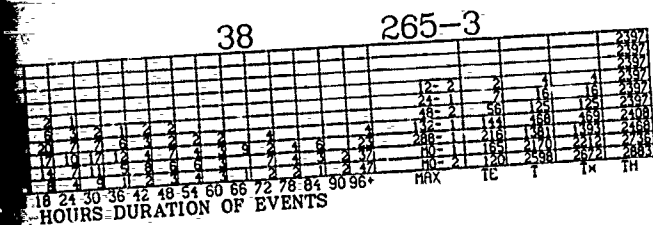
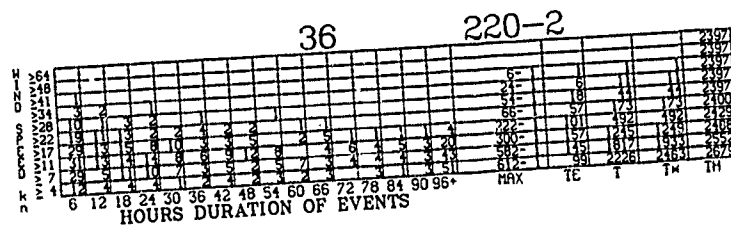
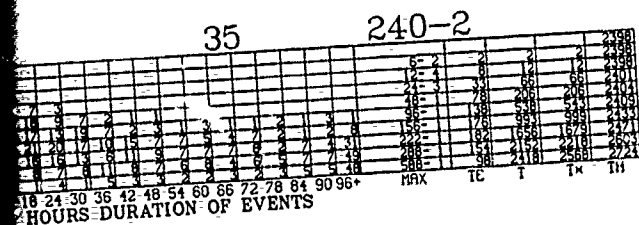
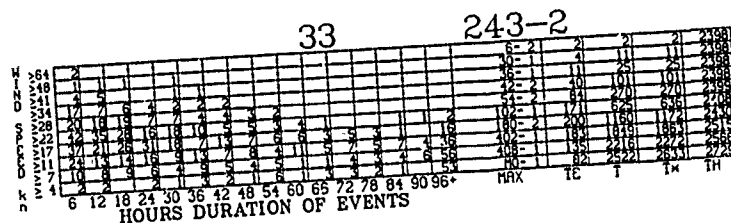
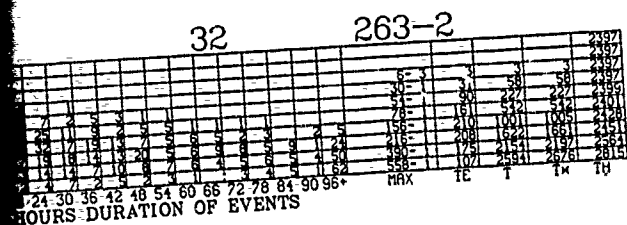
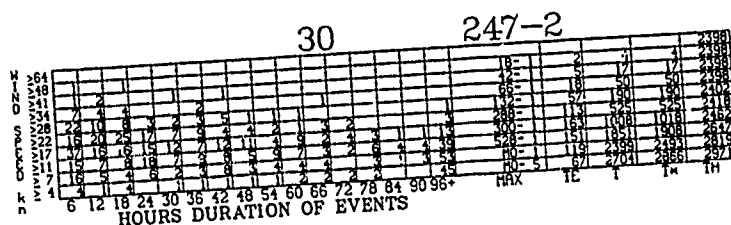
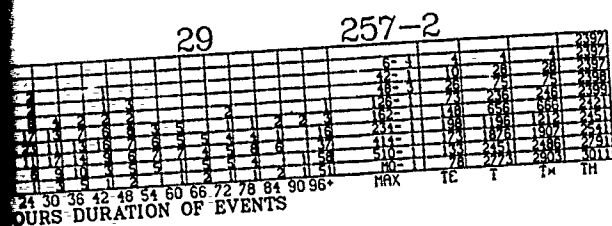
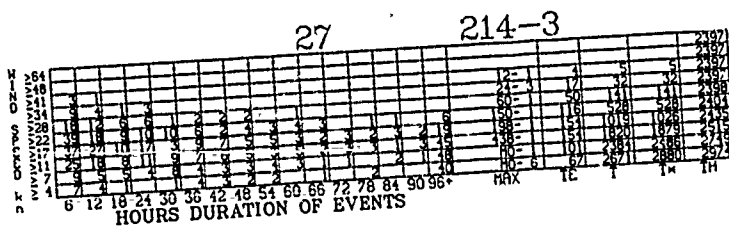
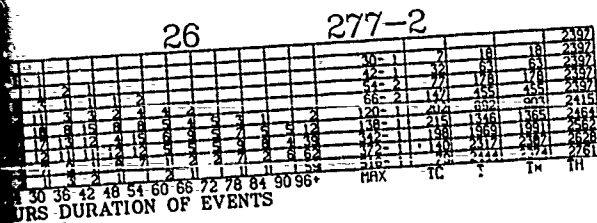
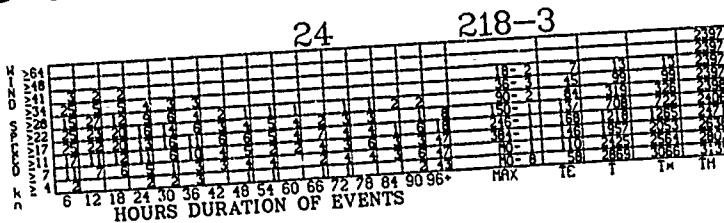
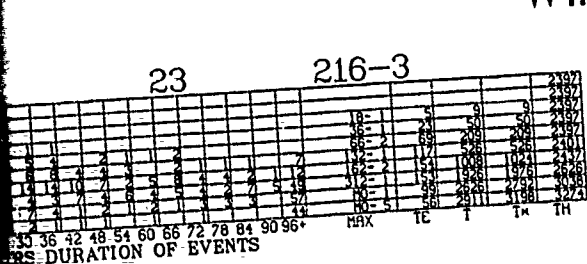
# APRIL

# WIN

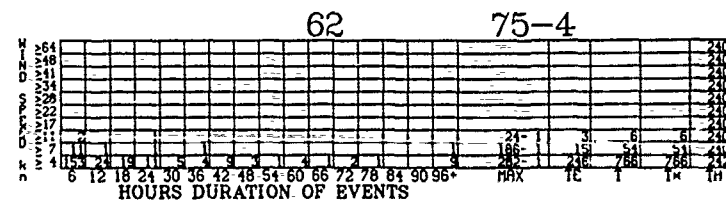
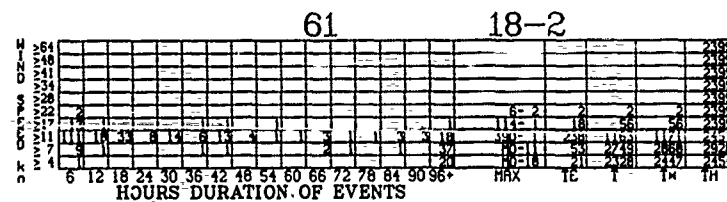
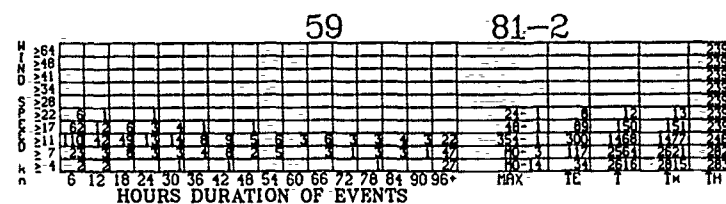
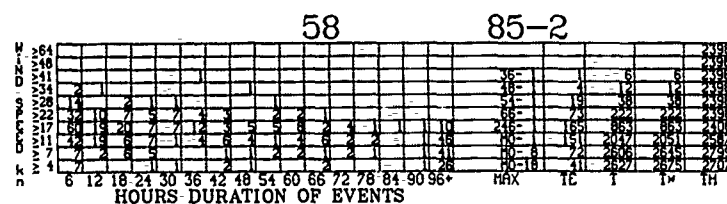
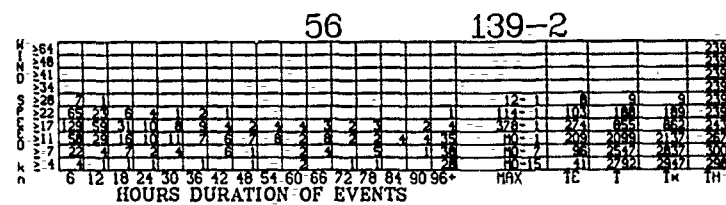
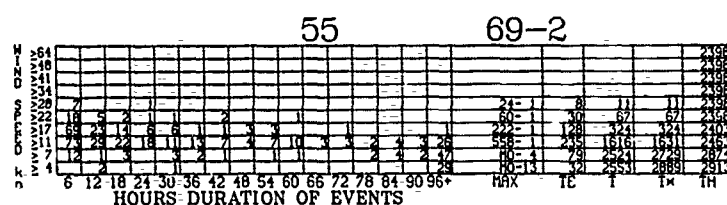
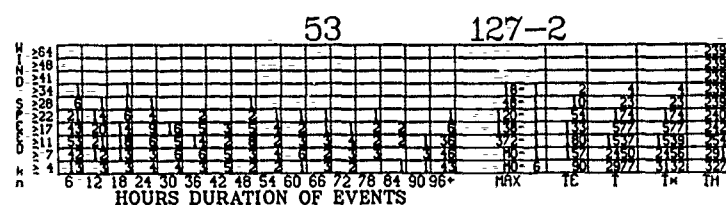
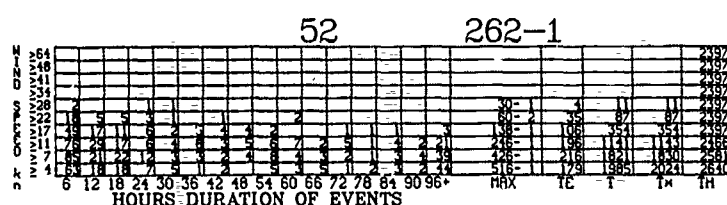
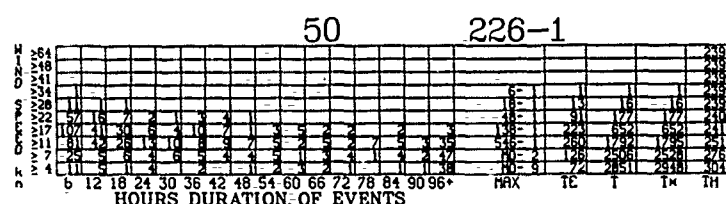
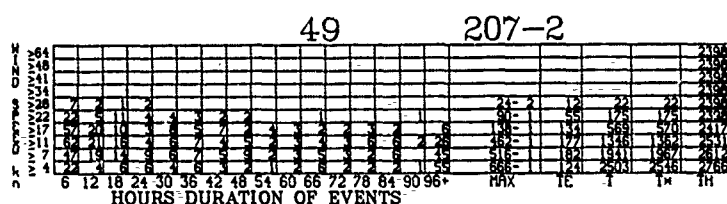
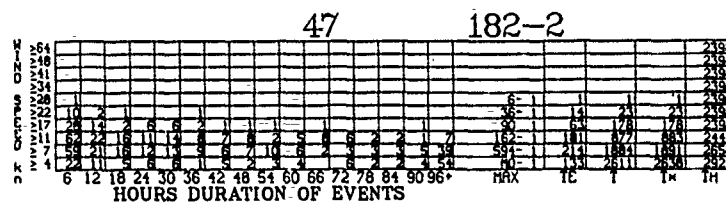
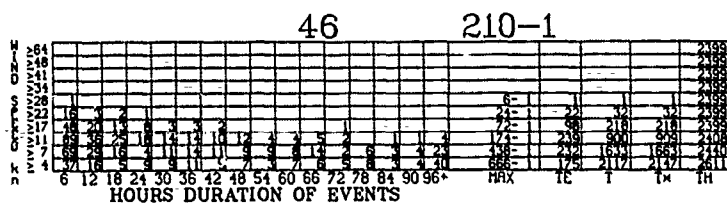
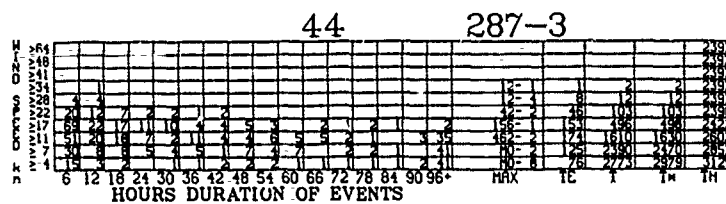
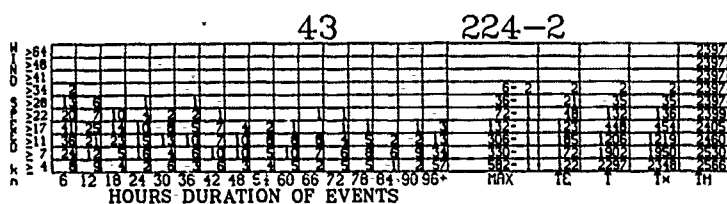




# WIND SPEED DURATIONS (Cont'd)



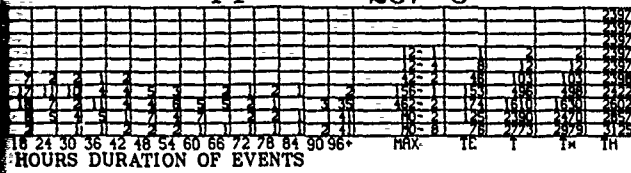
# WIND SPEED DURATIONS (Cont'd)



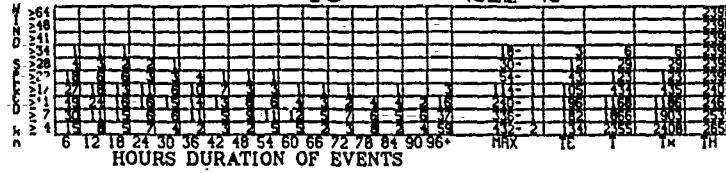


# APRIL

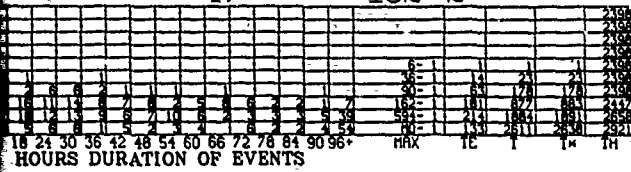
44 287-3



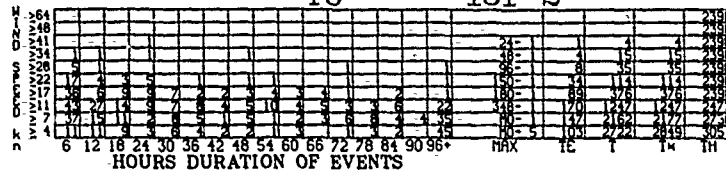
45 211-2



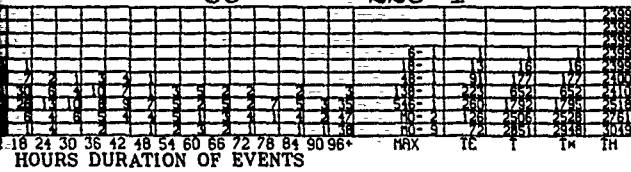
47 182-2



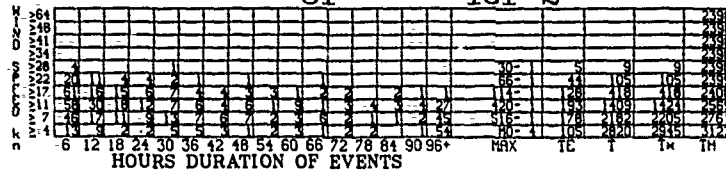
48 151-2



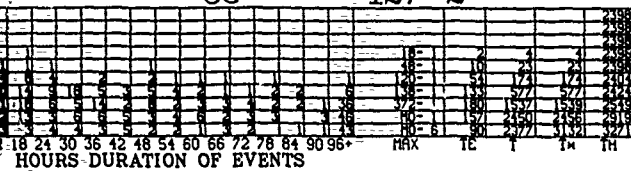
50 226-1



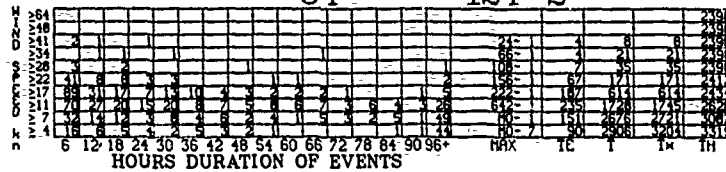
51 161-2



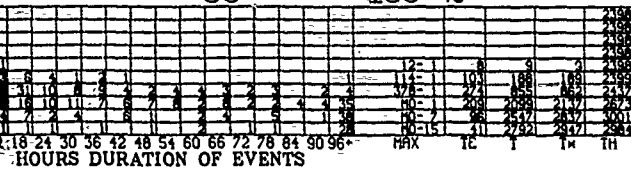
53 127-2



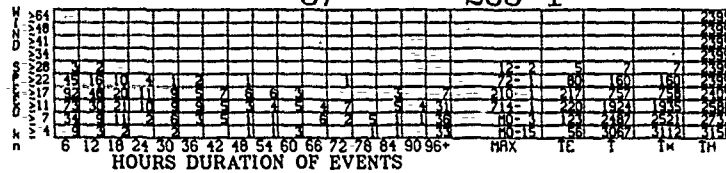
54 124-2



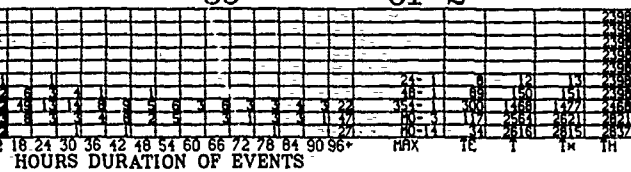
56 139-2



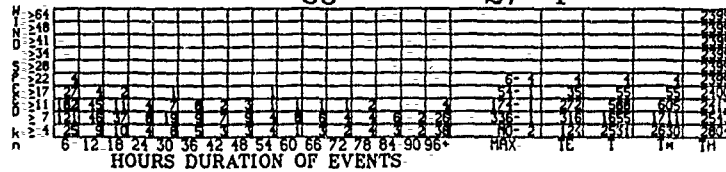
57 283-1



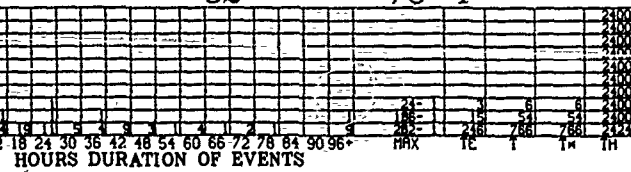
59 81-2



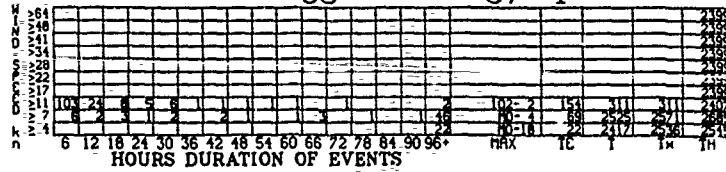
60 27-4



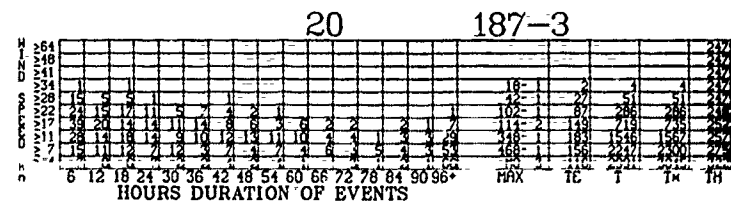
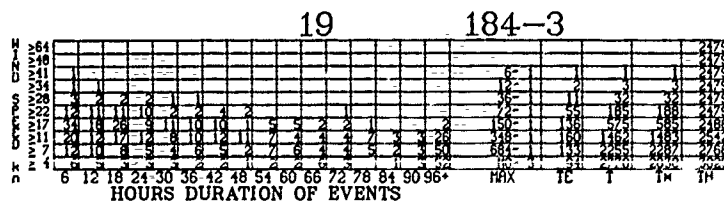
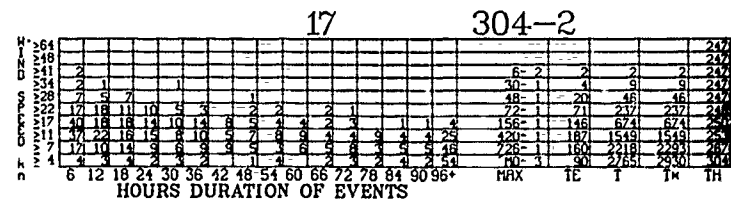
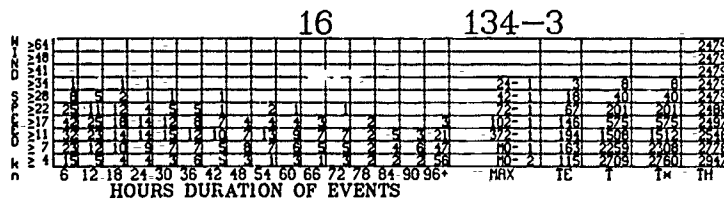
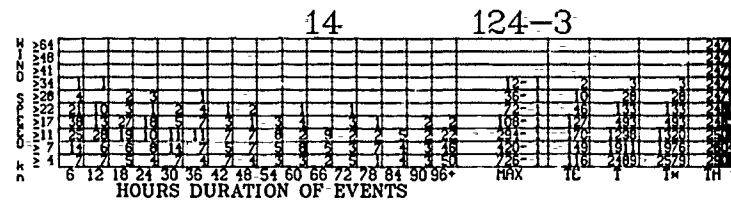
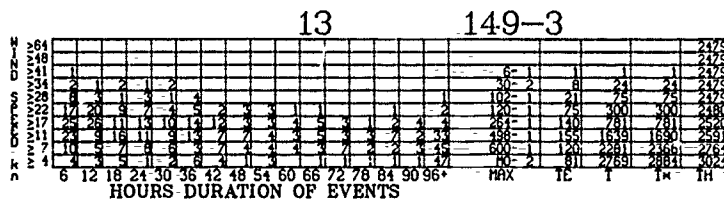
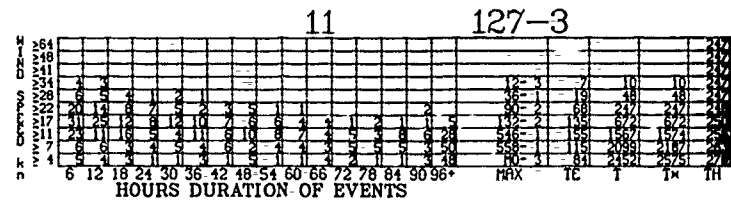
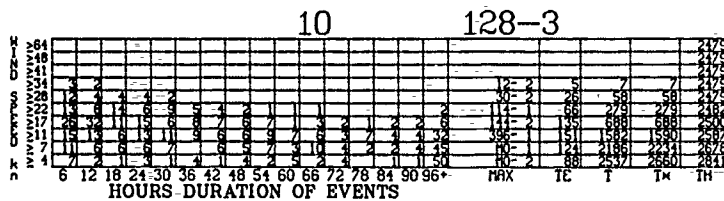
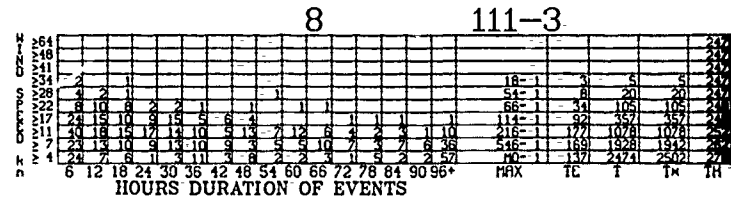
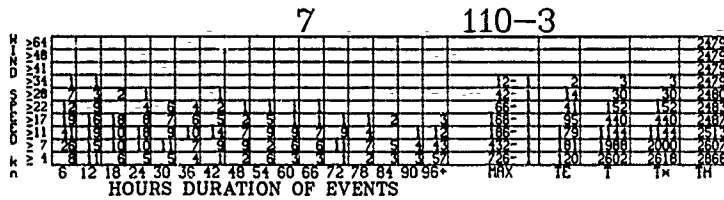
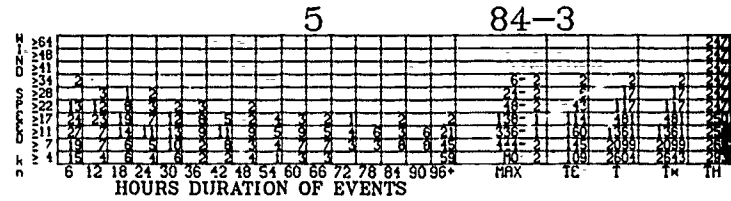
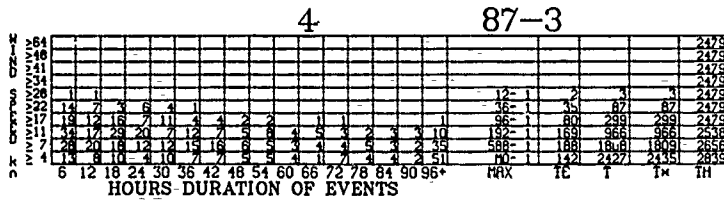
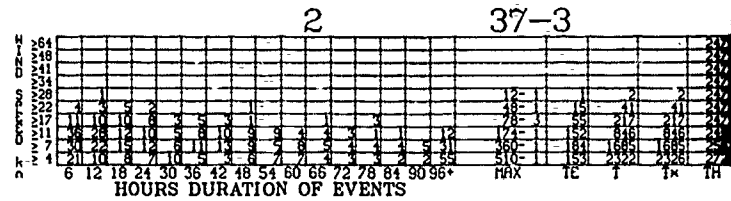
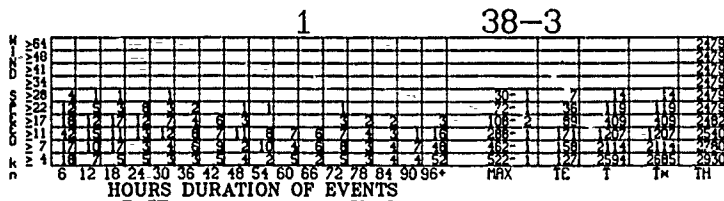
62 75-4



63 37-4

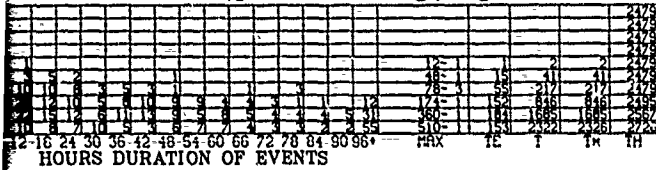


# JULY

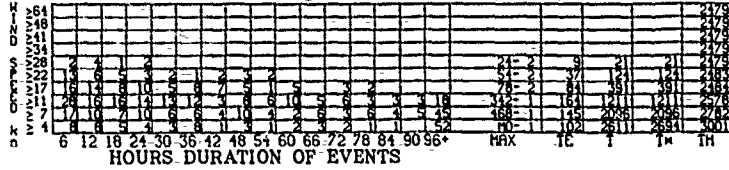


# WIND SPEED DURATIONS

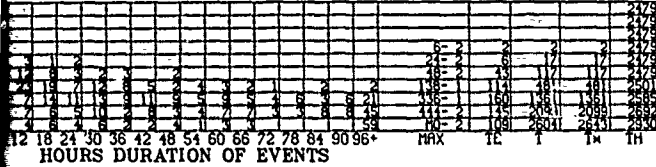
2 37-3



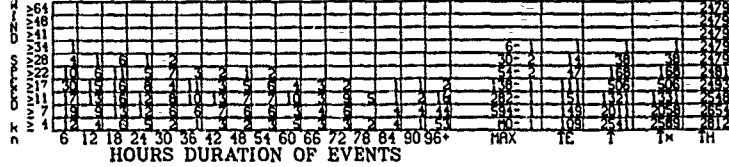
3 62-3



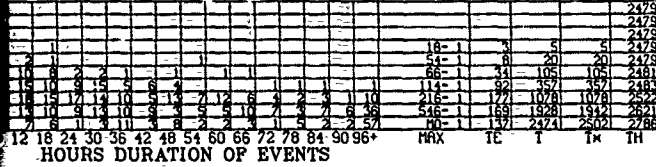
5 84-3



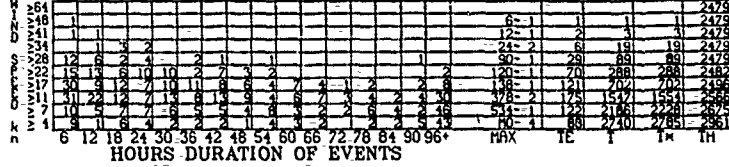
6 107-3



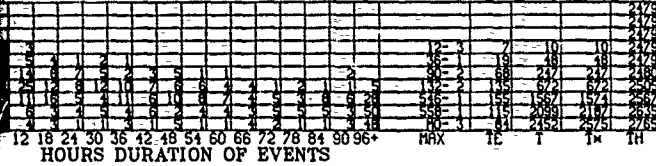
8 111-3



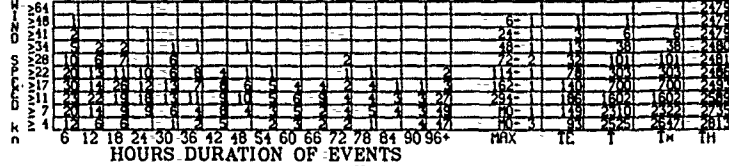
9 129-3



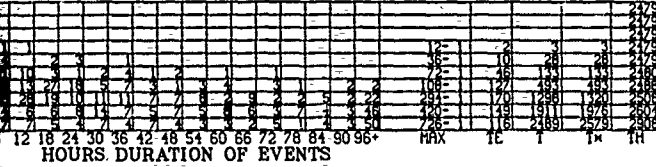
11 127-3



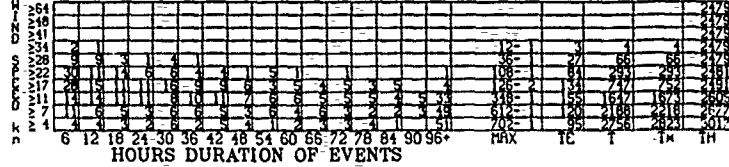
12 132-3



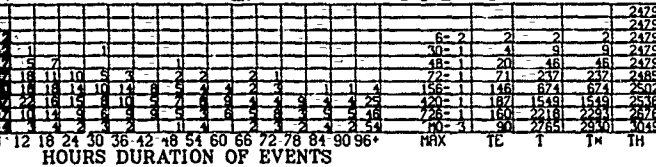
14 124-3



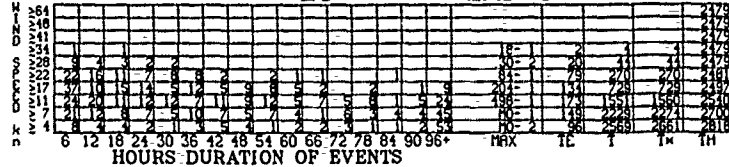
15 147-3



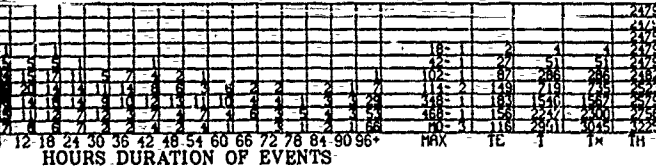
17 304-2



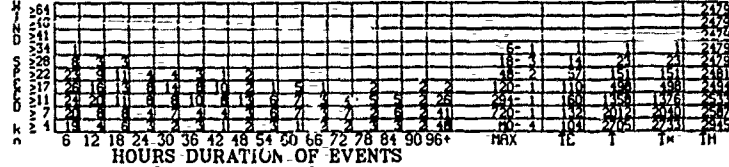
18 171-3



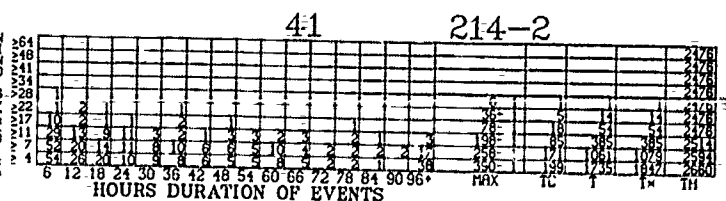
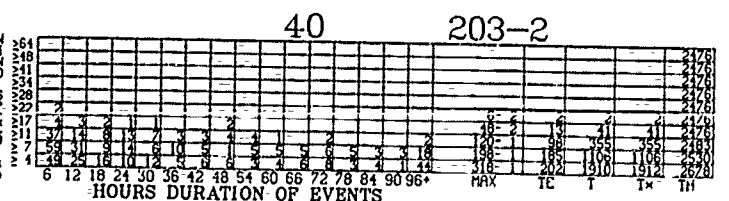
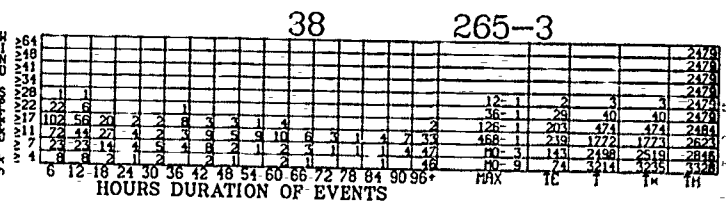
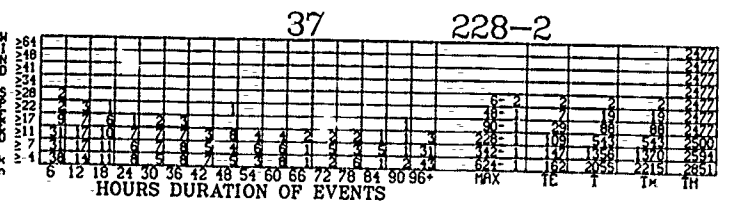
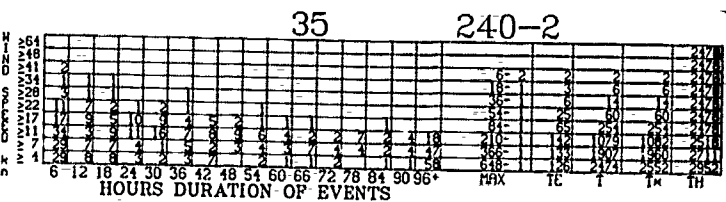
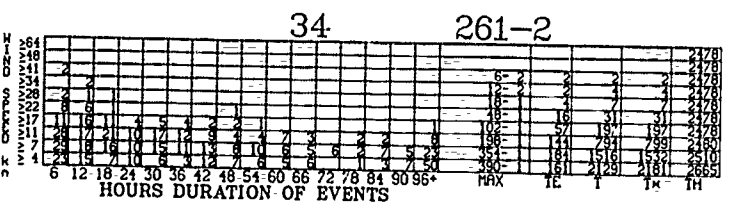
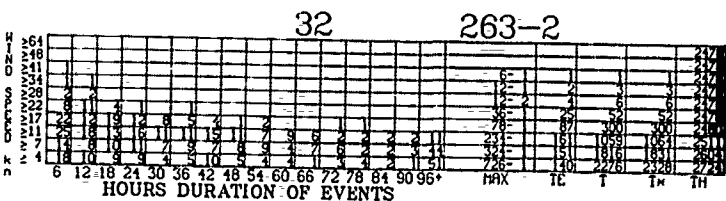
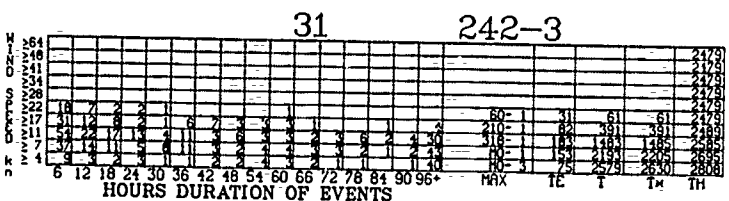
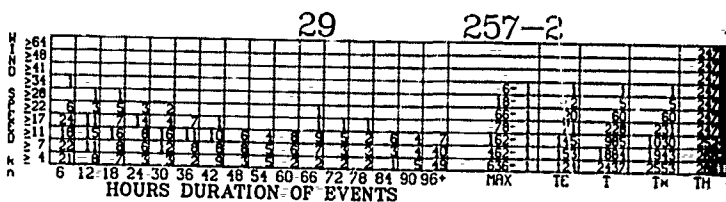
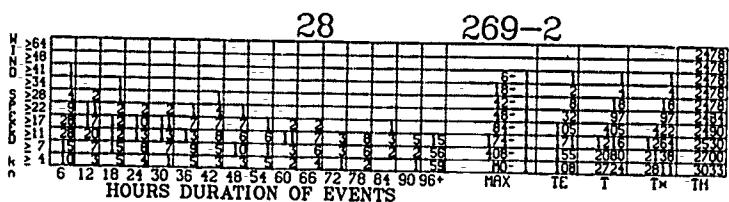
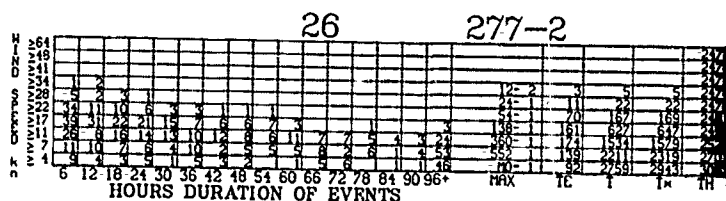
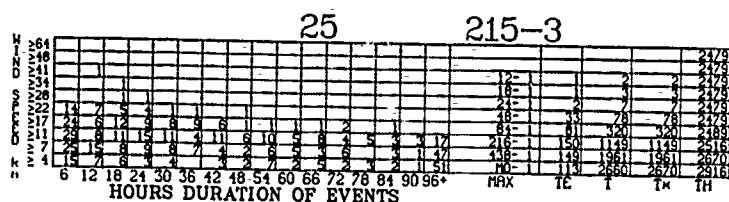
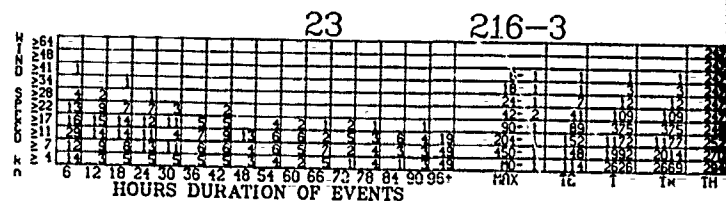
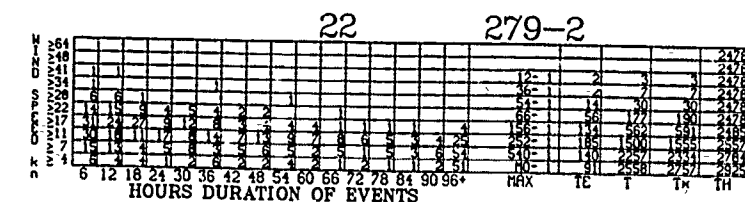
20 187-3



21 182-3

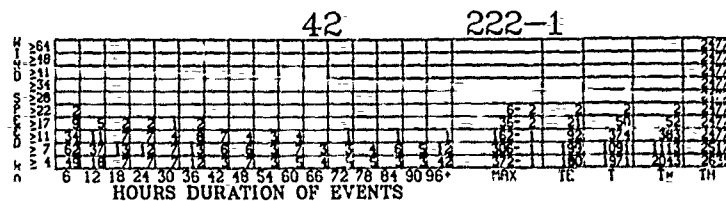
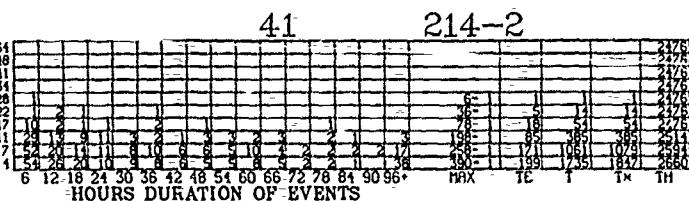
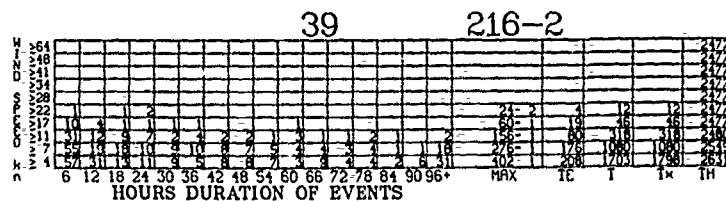
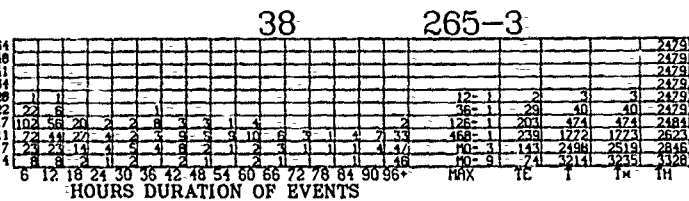
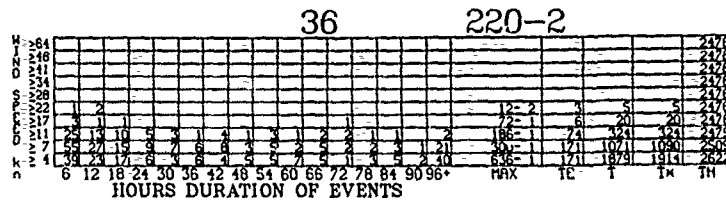
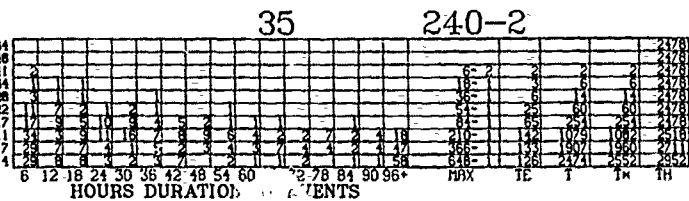
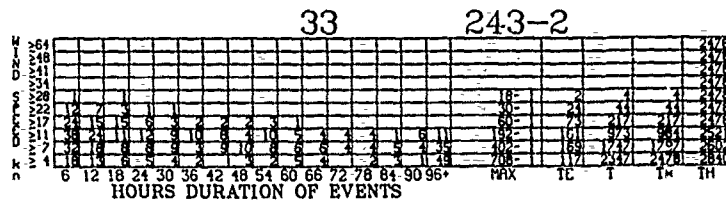
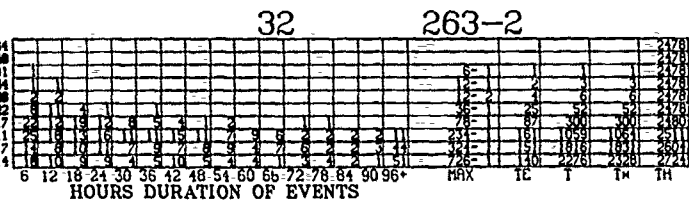
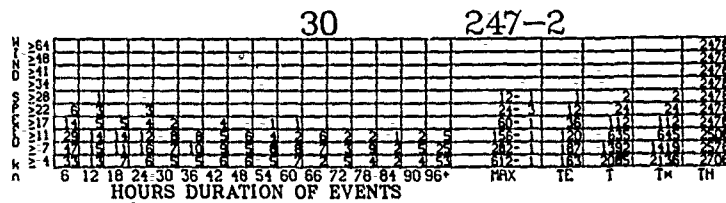
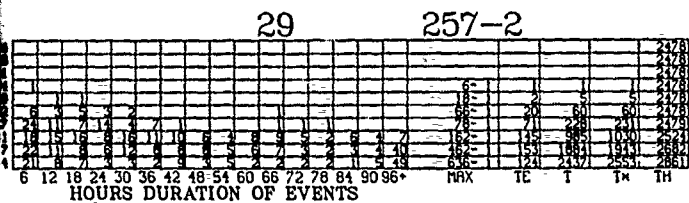
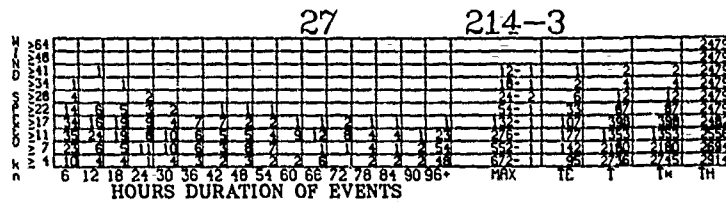
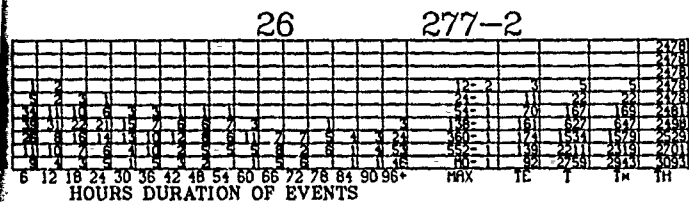
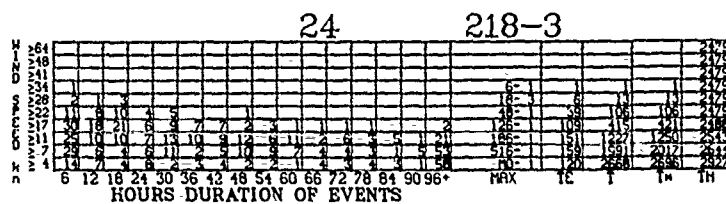
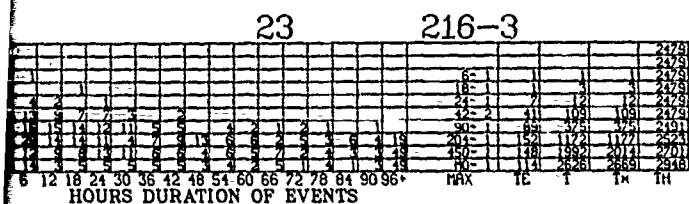


# WIND SPEED DURATIONS (Cont'd)



1

# JULY



2

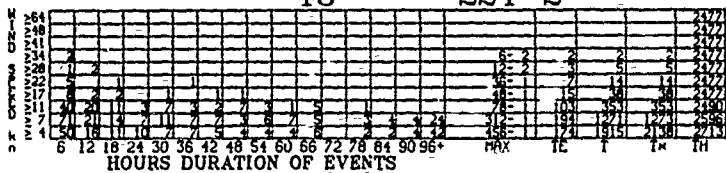


JULY

WII

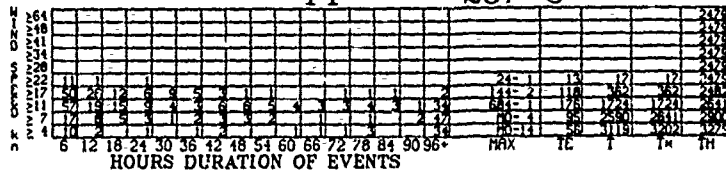
43

224-2



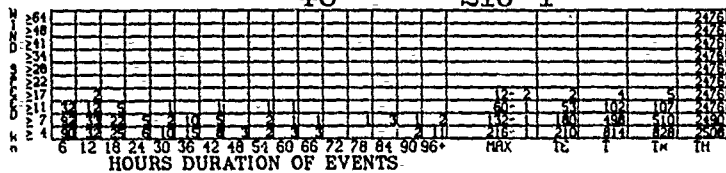
44

287-3



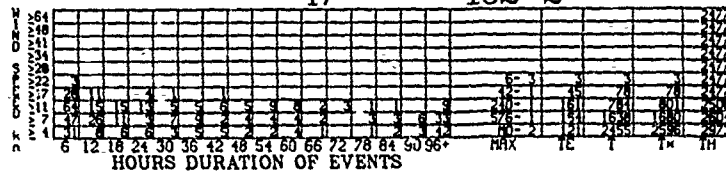
46

210-1



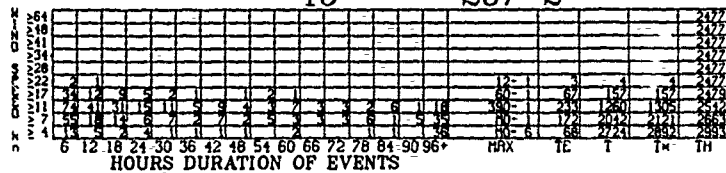
47

182-2



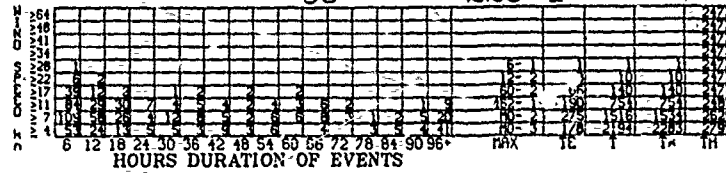
49

207-2



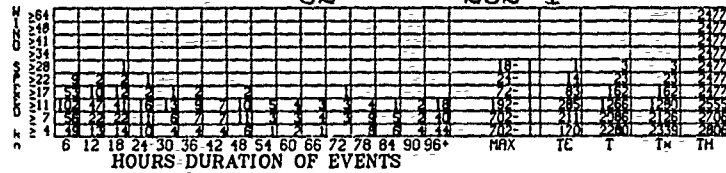
50

226-1



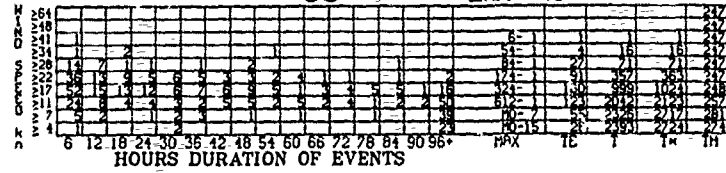
52

262-1



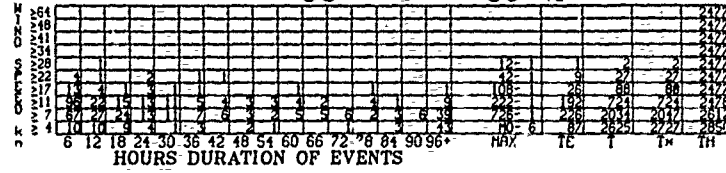
53

127-2



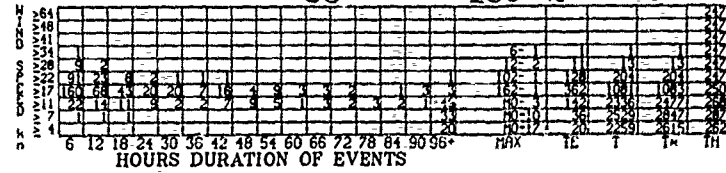
55

69-2



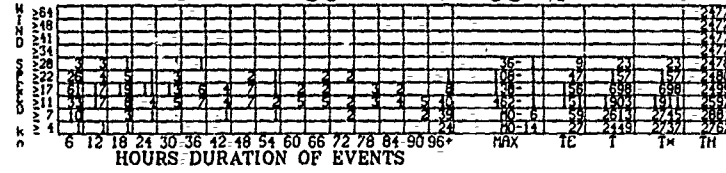
56

139-2



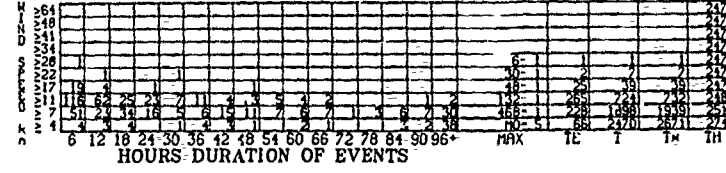
58

85-2



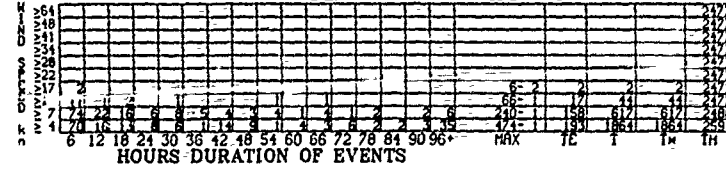
59

81-2



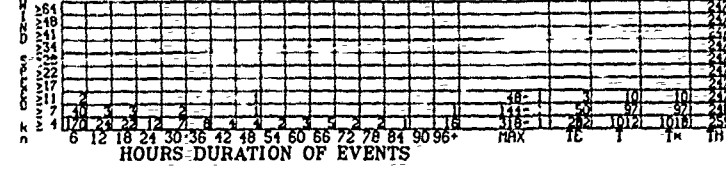
61

18-2

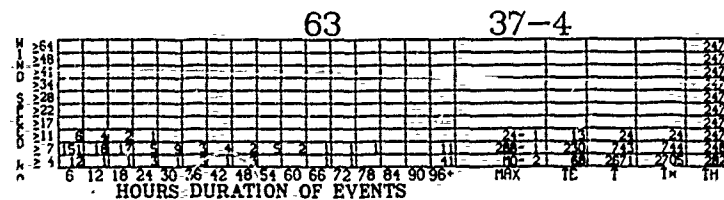
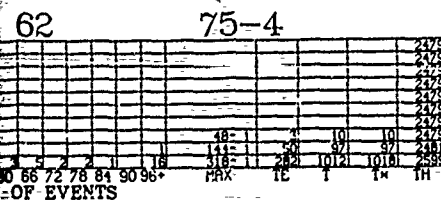
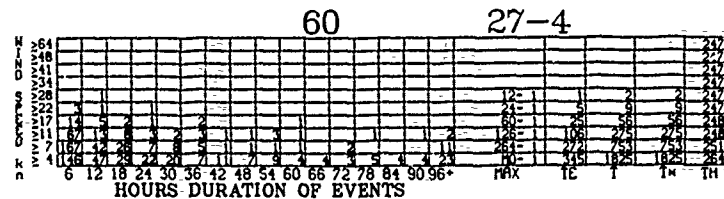
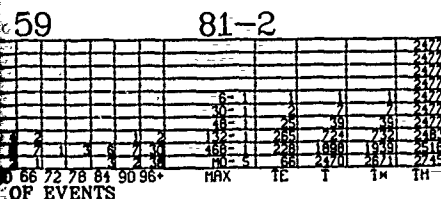
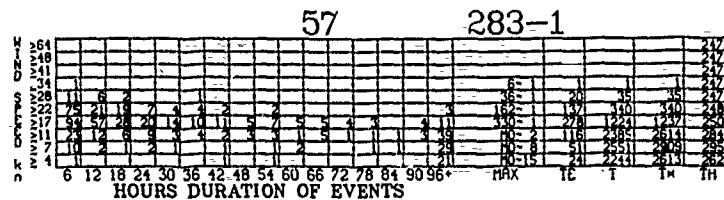
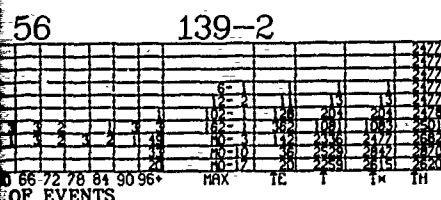
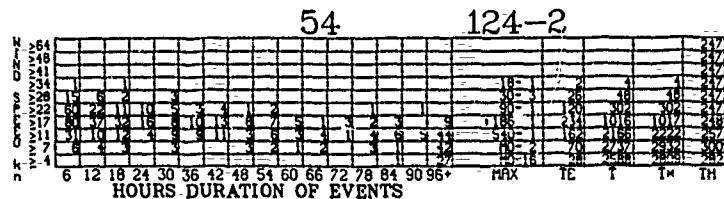
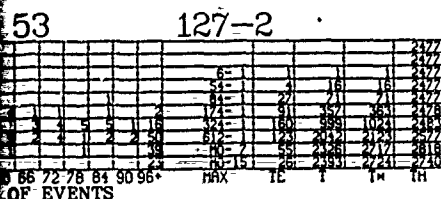
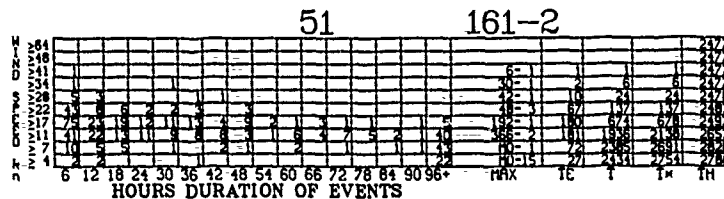
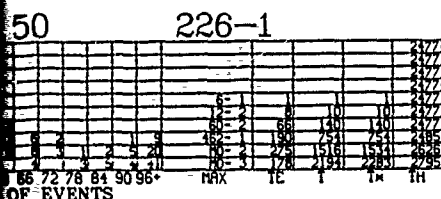
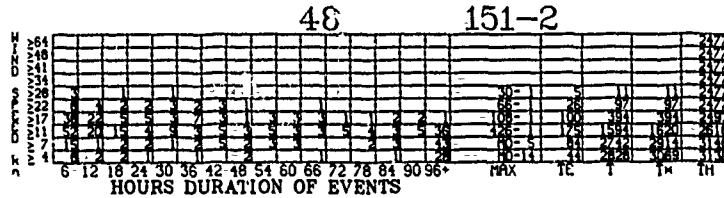
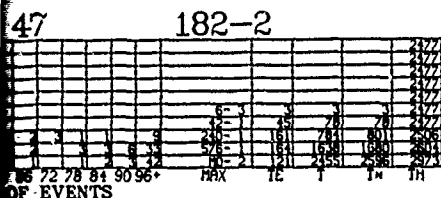
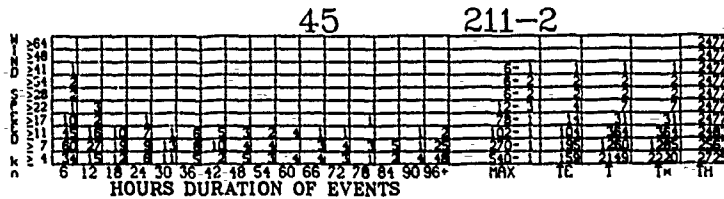
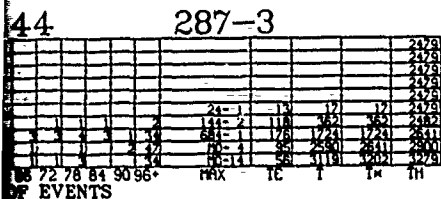


62

75-4

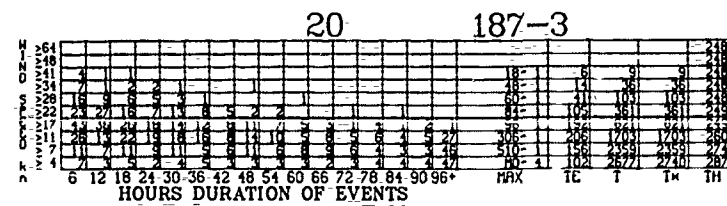
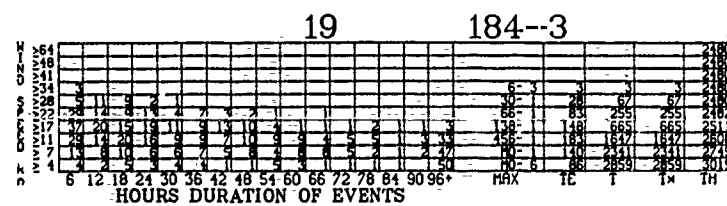
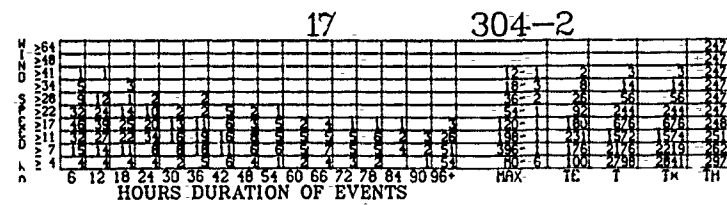
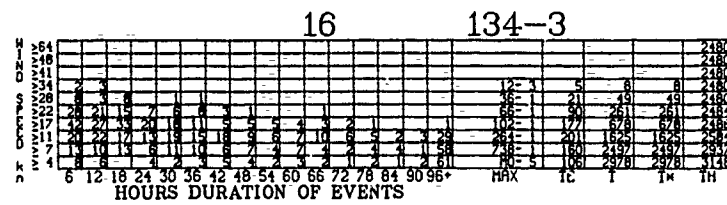
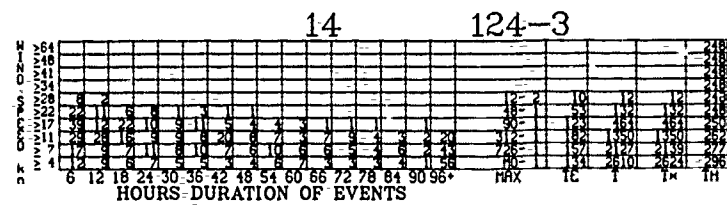
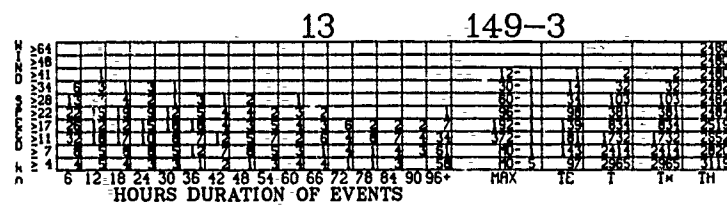
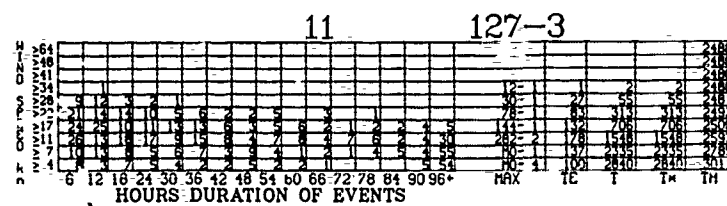
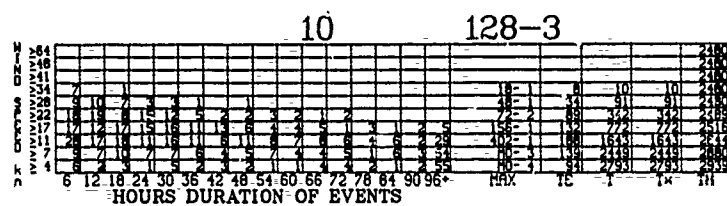
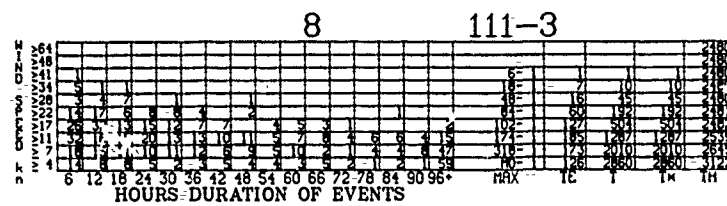
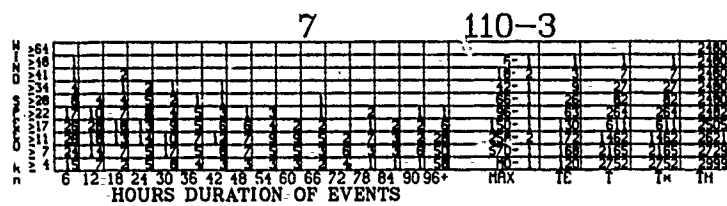
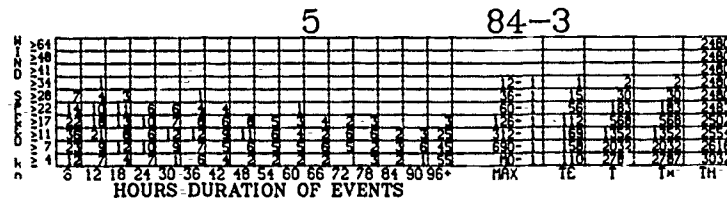
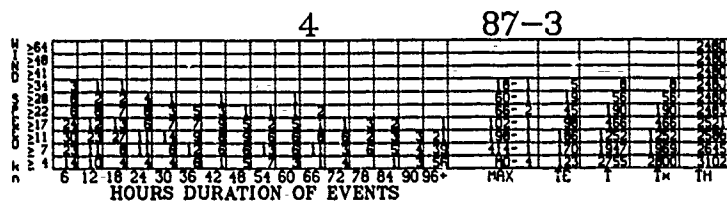
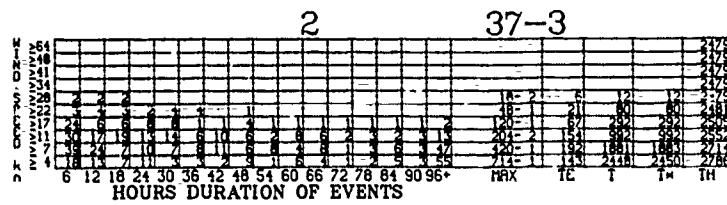
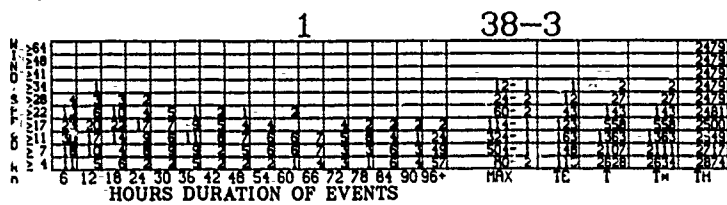


# WIND SPEED DURATIONS (Cont'd)



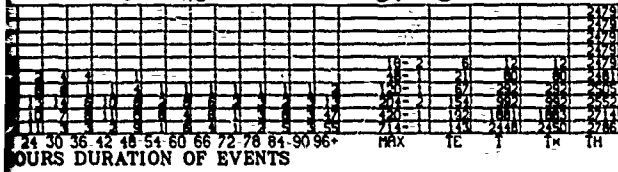


# WIND SPEED DURATIONS

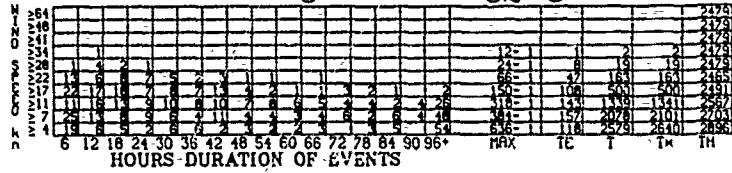


# AUGUST

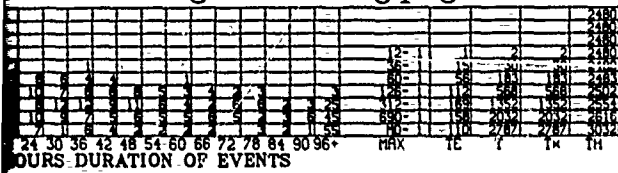
2 37-3



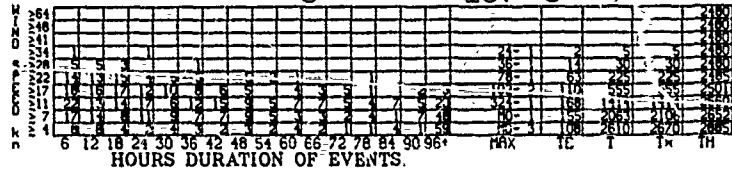
3 62-3



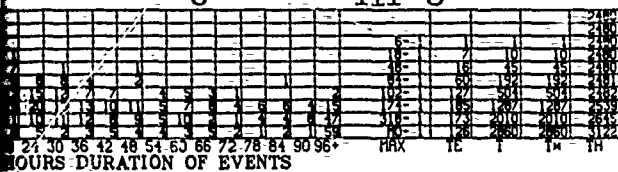
5 84-3



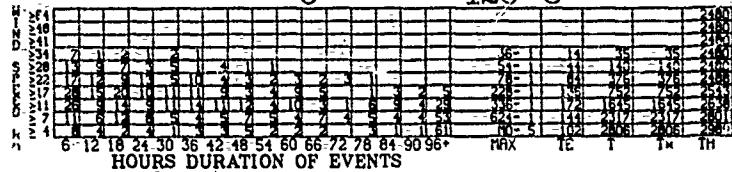
6 107-3



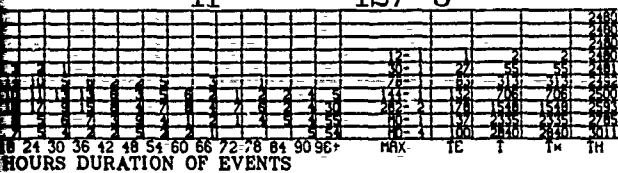
8 111-3



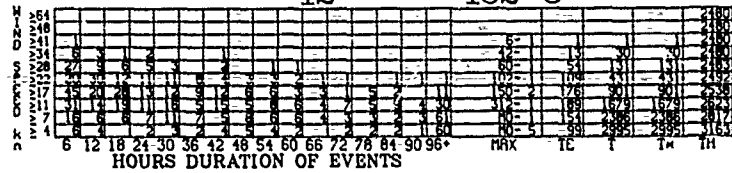
9 129-3



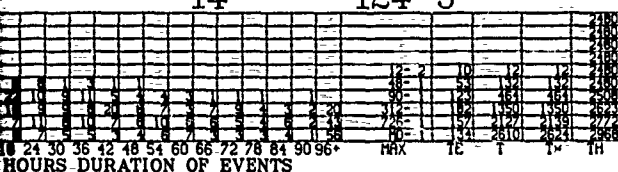
11 127-3



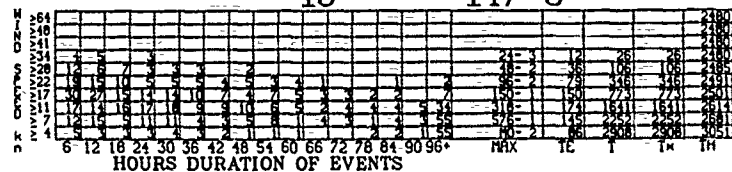
12 132-3



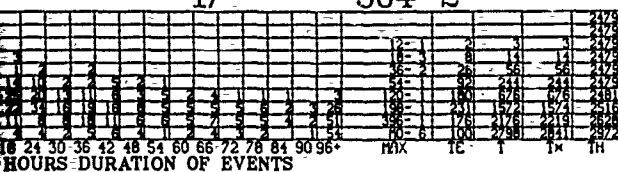
14 124-3



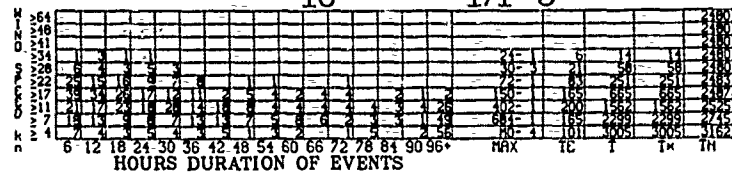
15 147-3



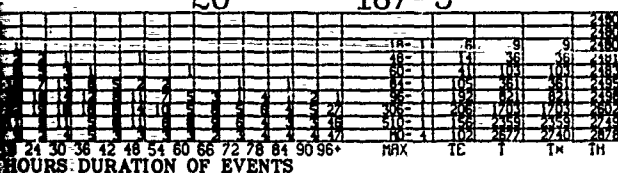
17 304-2



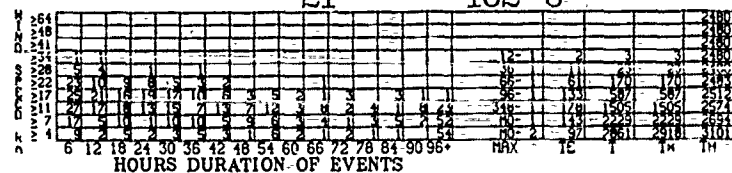
18 171-3



20 187-3

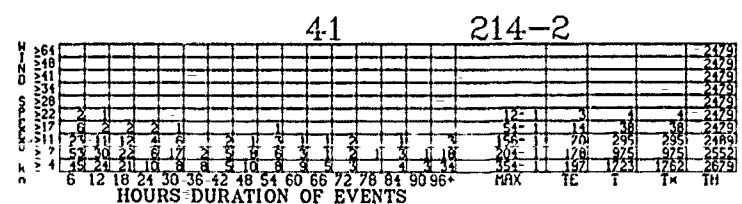
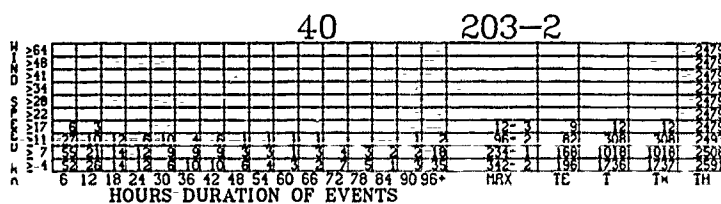
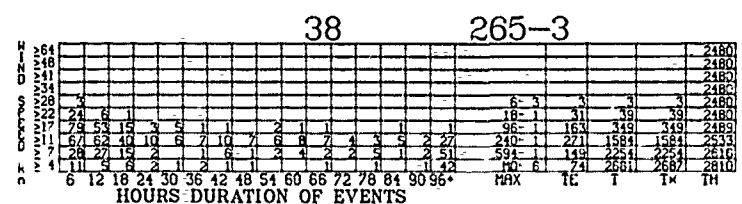
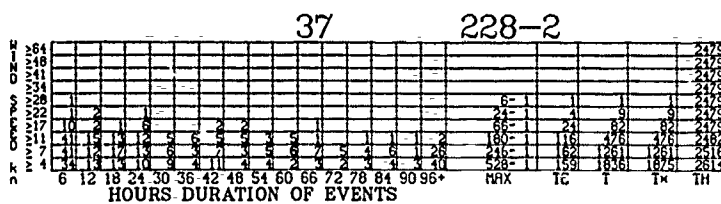
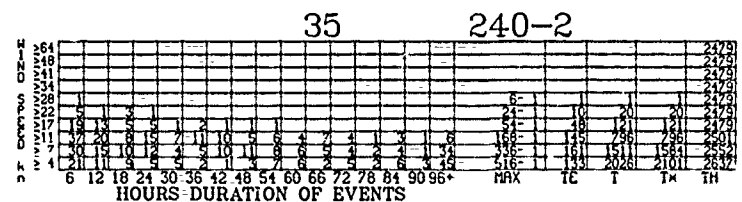
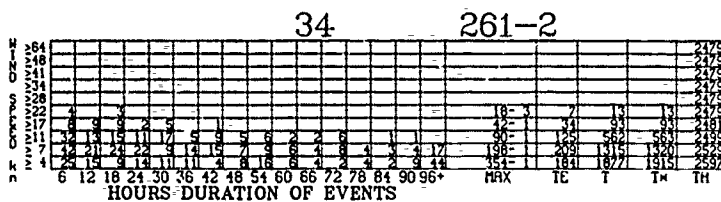
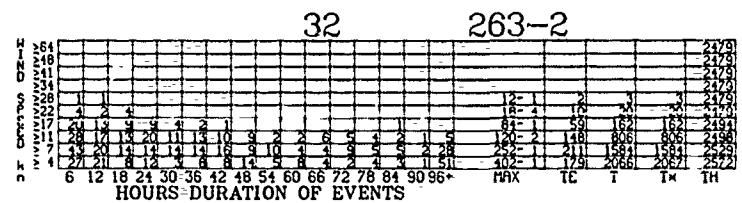
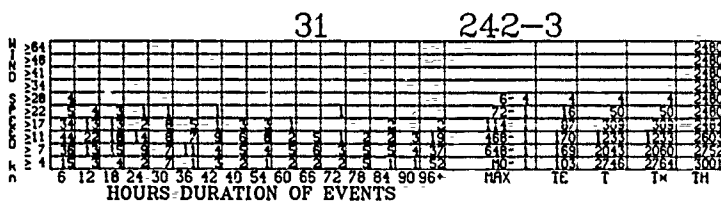
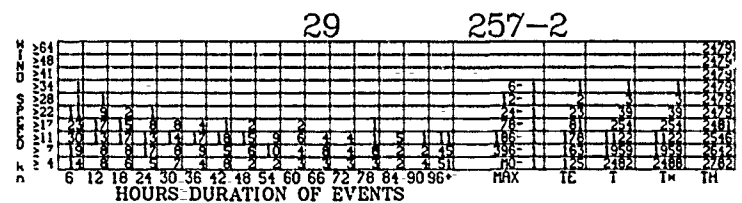
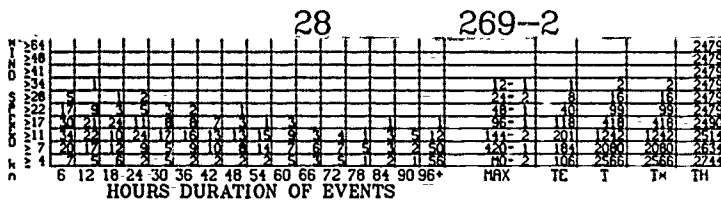
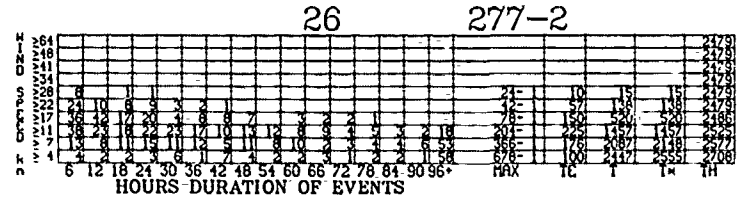
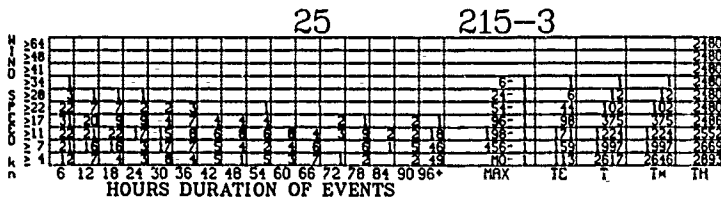
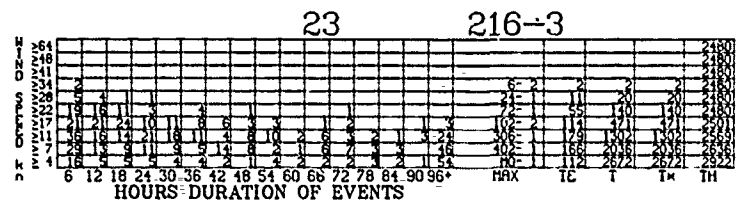
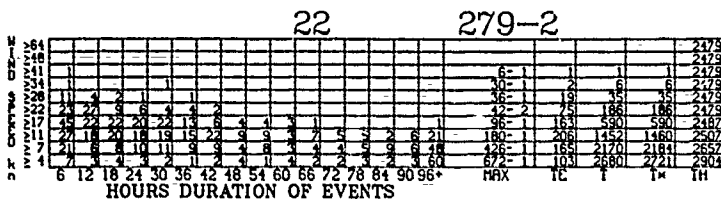


21 182-3



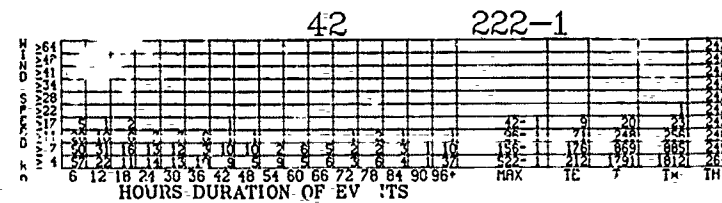
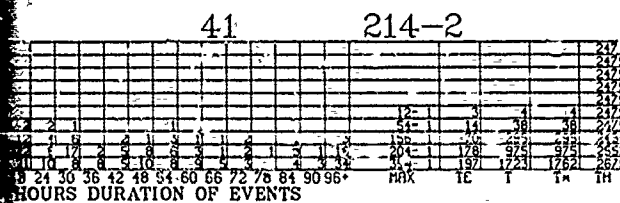
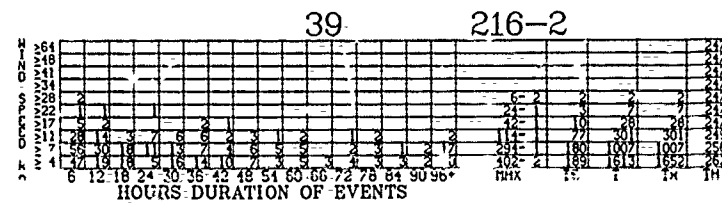
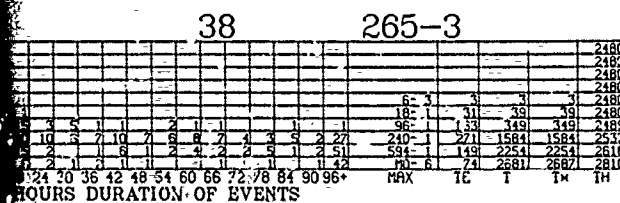
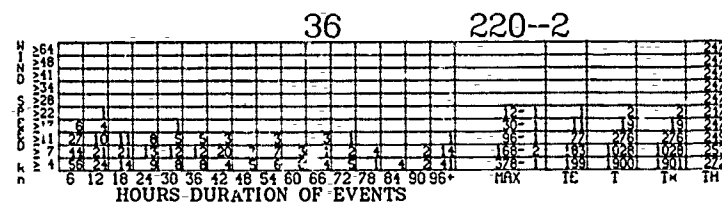
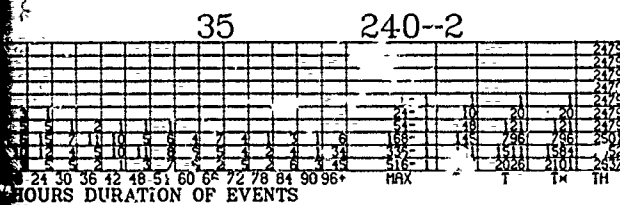
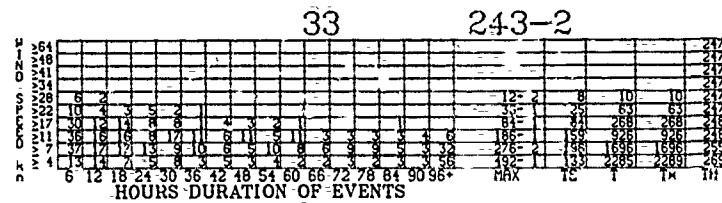
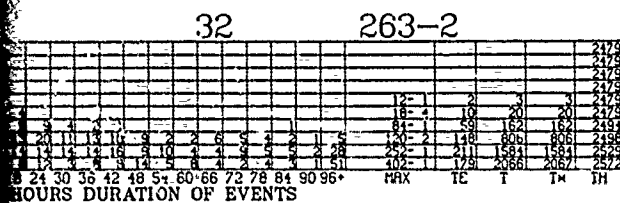
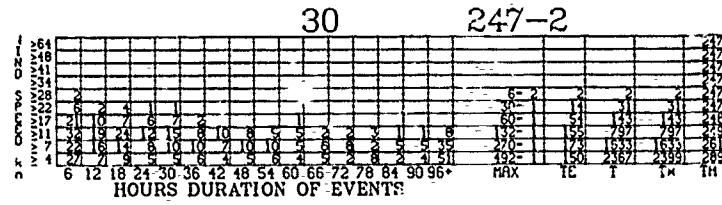
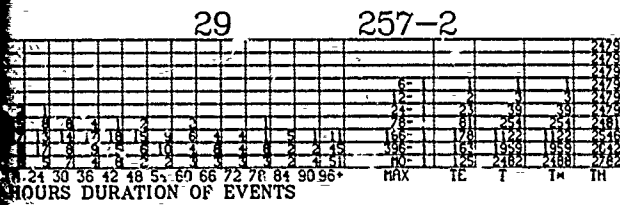
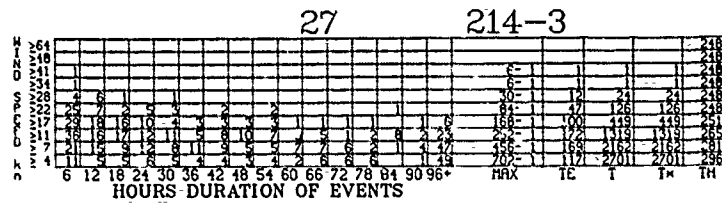
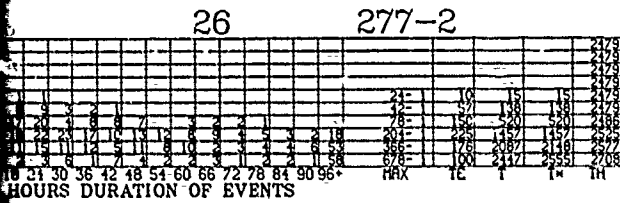
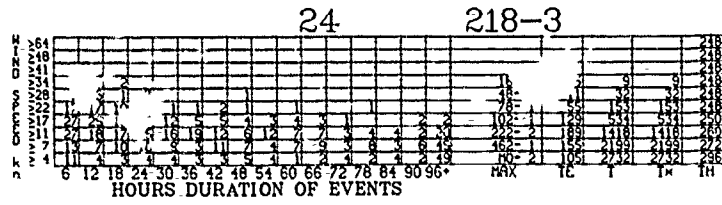
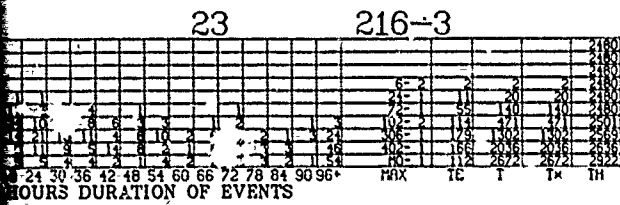
# AUGUST

# WIN



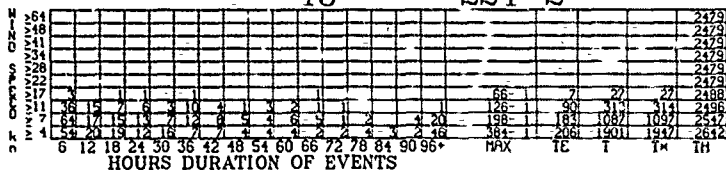
①

# WIND SPEED DURATIONS (Cont'd)

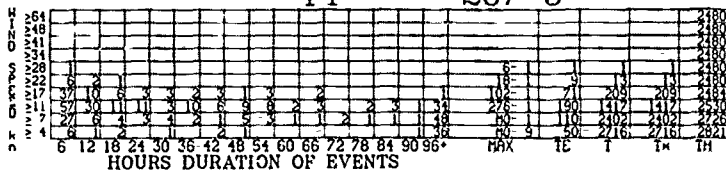


# WIND SPEED DURATIONS (Cont'd)

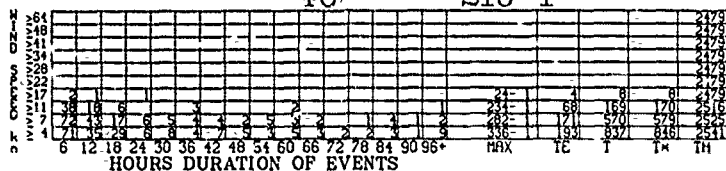
43 224-2



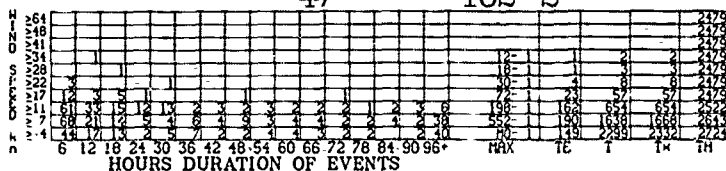
44 287-3



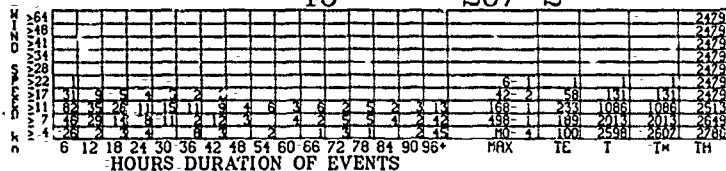
46 210-1



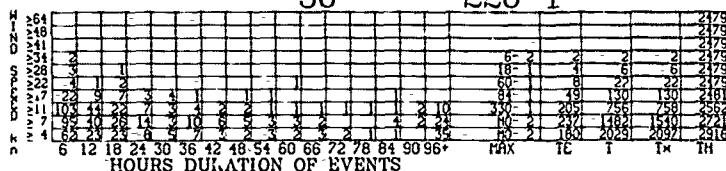
47 182-2



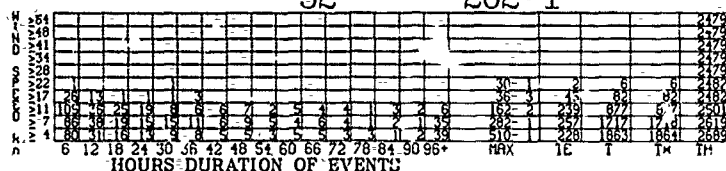
49 207-2



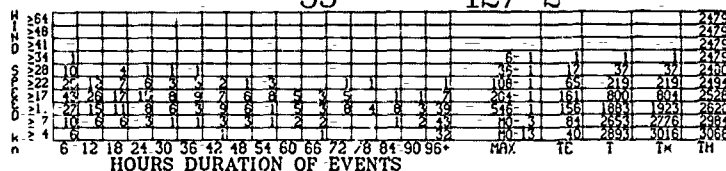
50 226-1



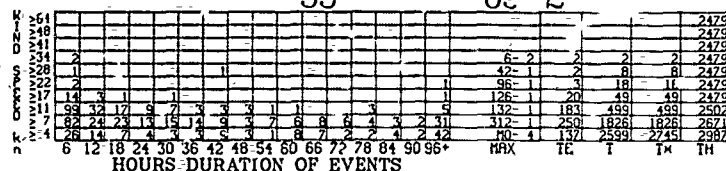
52 262-1



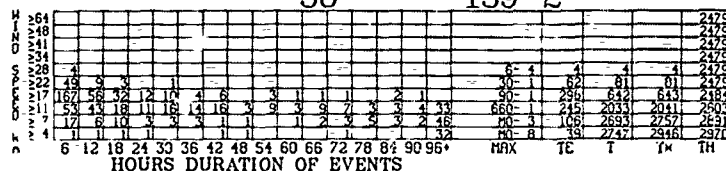
53 127-2



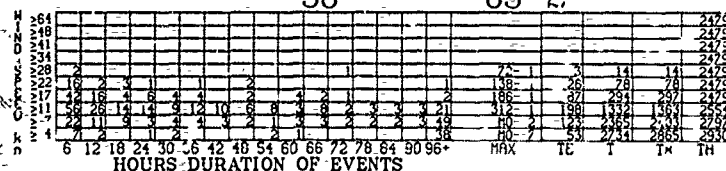
55 68-2



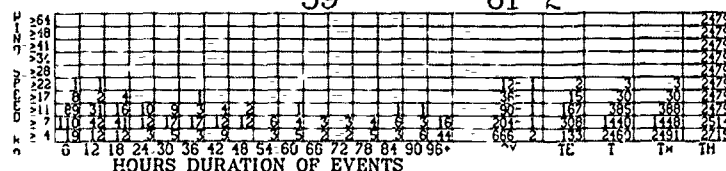
56 139-2



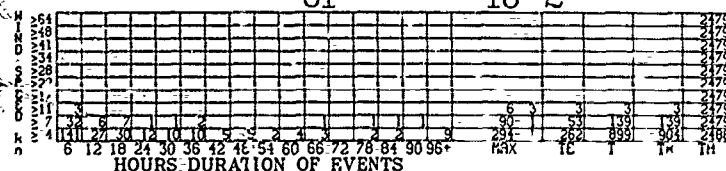
58 85-2



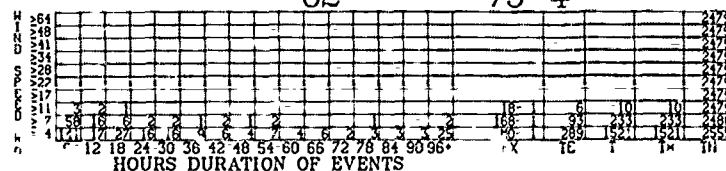
59 81-2



61 18-2



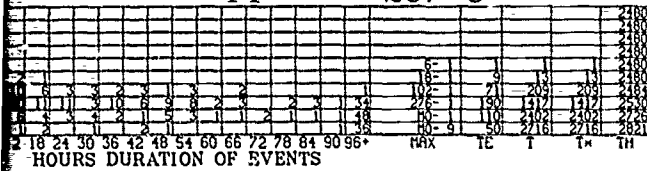
62 75-4



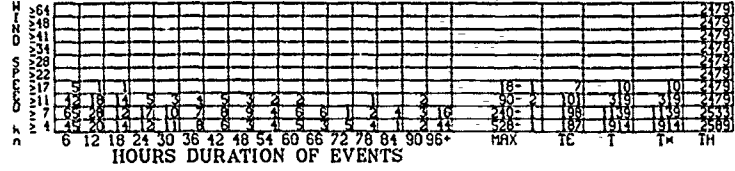


# AUGUST

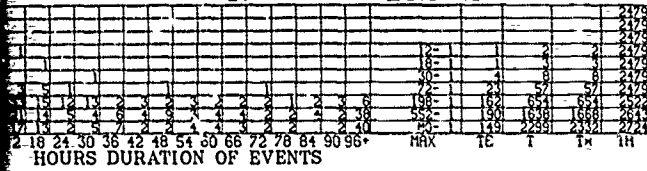
4.4 287-3



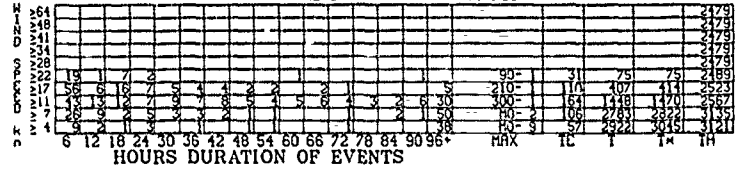
45 211-2



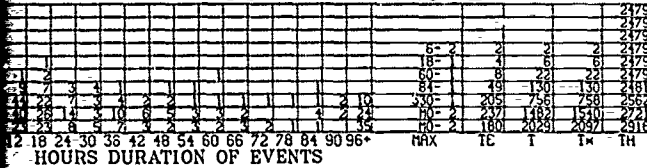
47 182-2



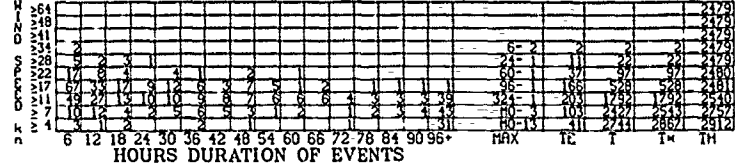
48 151-2



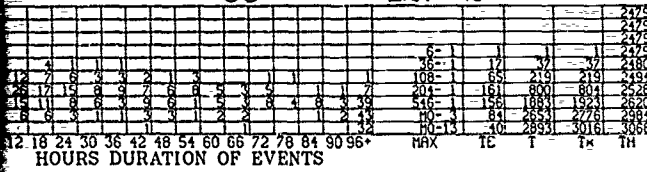
50 226-1



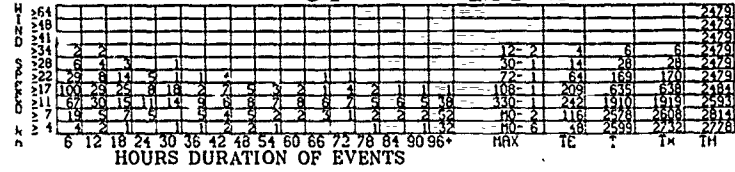
51 161-2



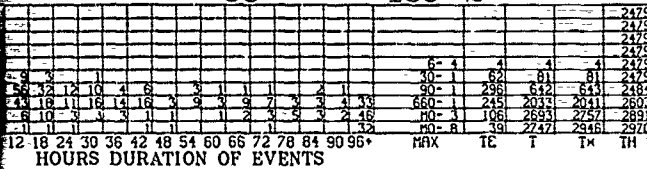
53 127-2



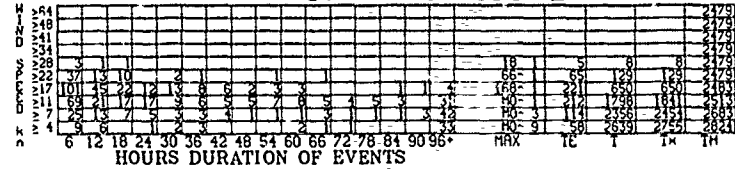
54 124-2



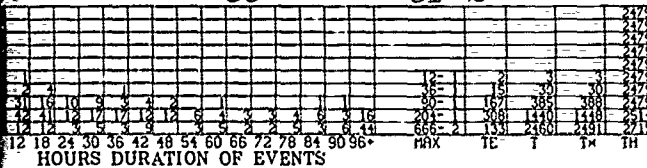
56 139-2



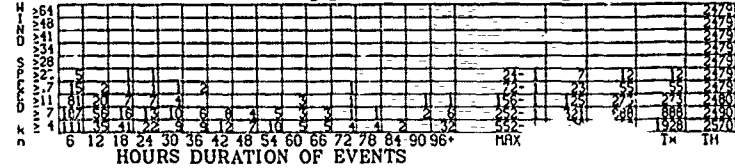
57 283-1



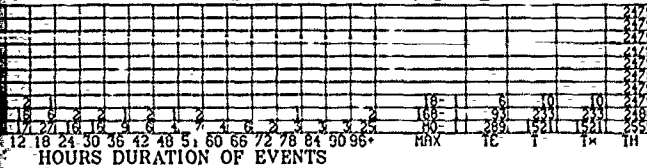
59 81-2



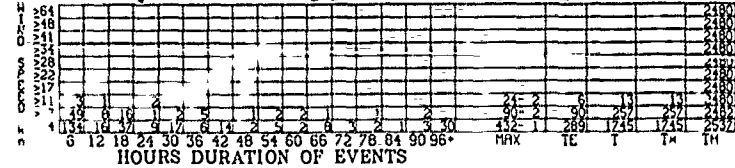
60 27-4



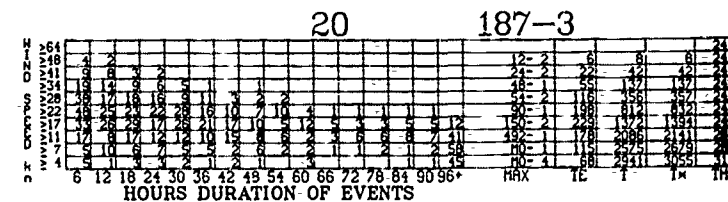
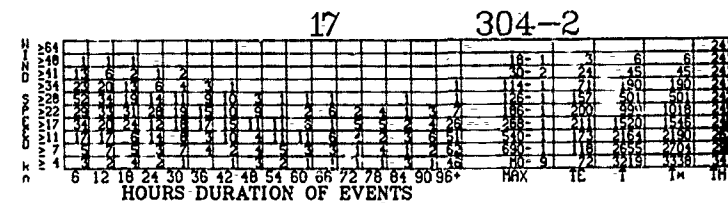
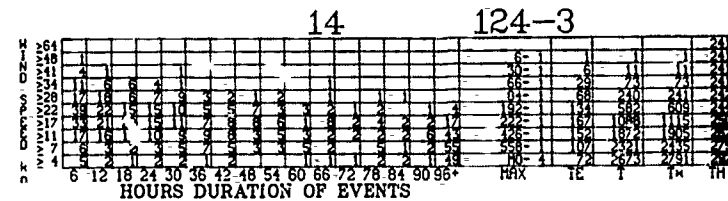
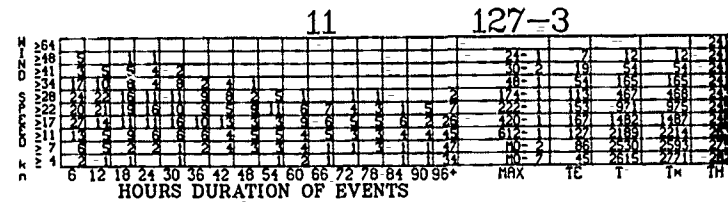
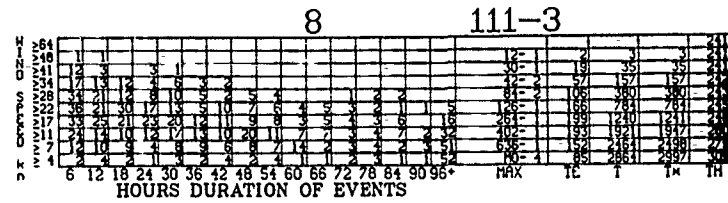
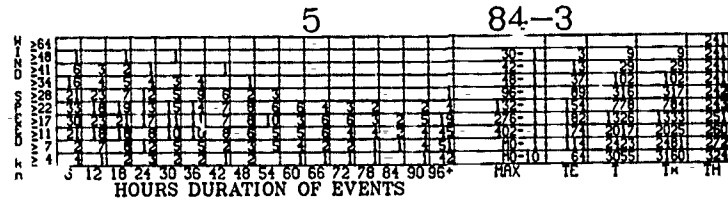
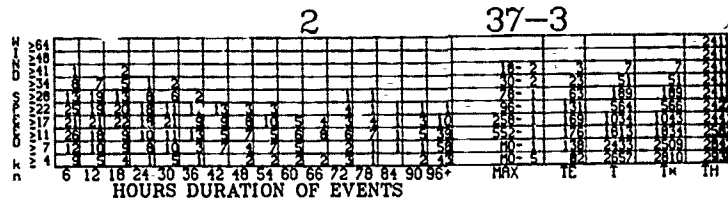
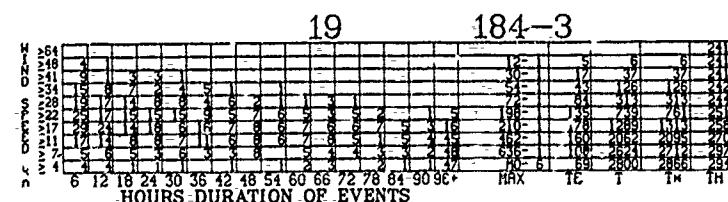
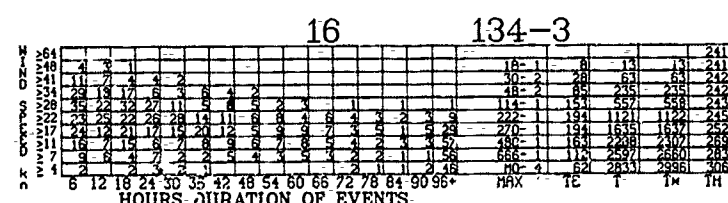
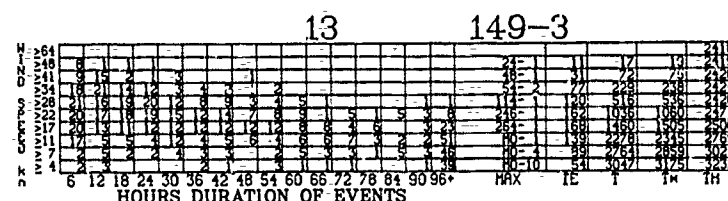
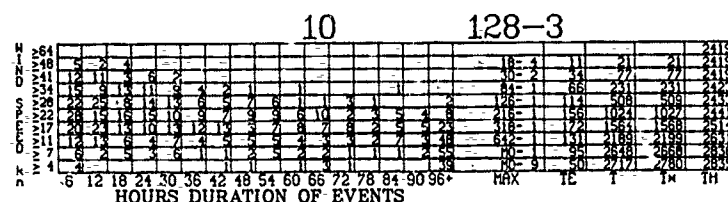
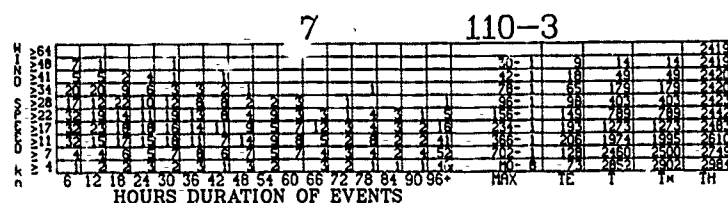
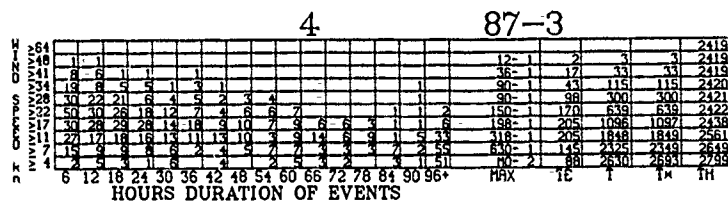
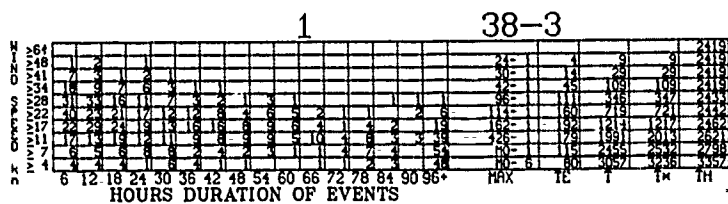
62 75-4



63 37-4



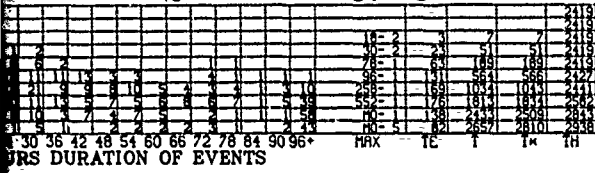
# OCTOBER



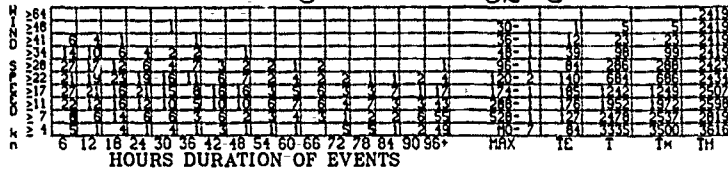


# WIND SPEED DURATIONS

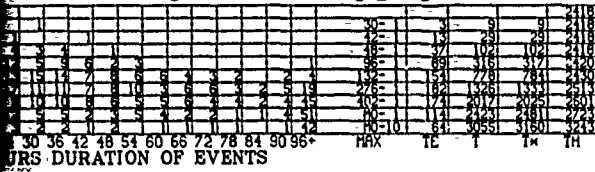
2 37-3



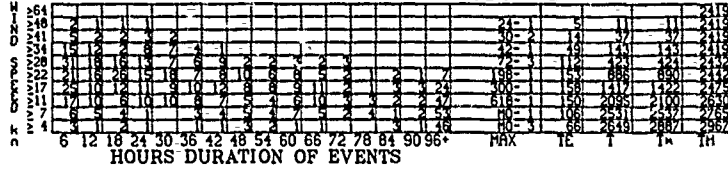
3 62-3



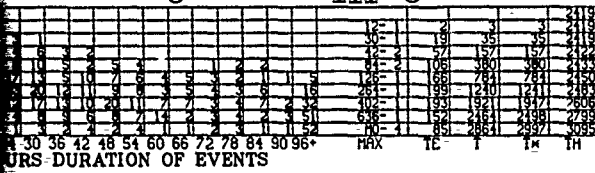
5 84-3



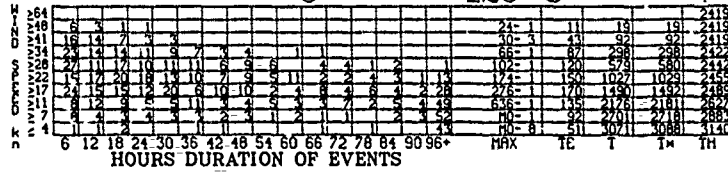
6 107-3



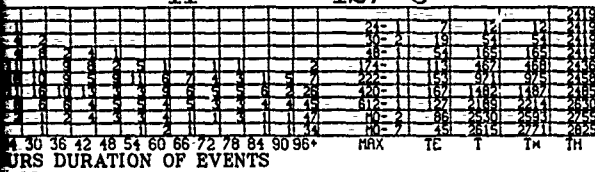
8 111-3



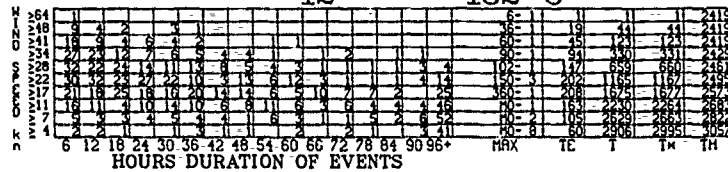
9 129-3



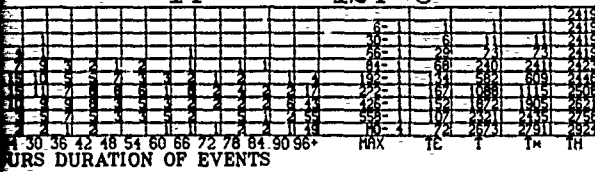
11 127-3



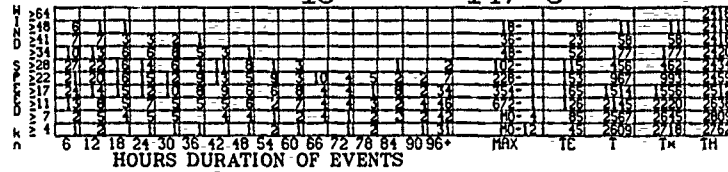
12 132-3



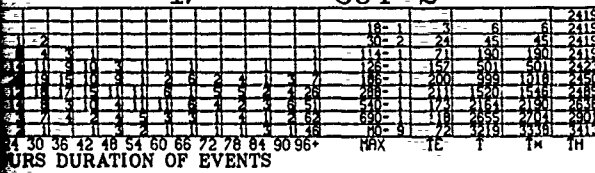
14 124-3



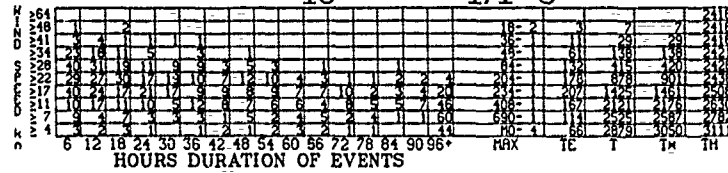
15 147-3



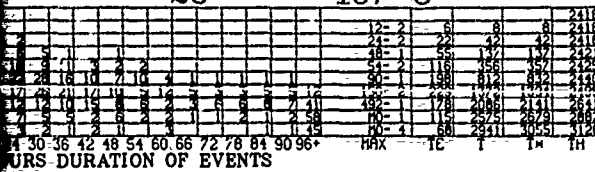
17 304-2



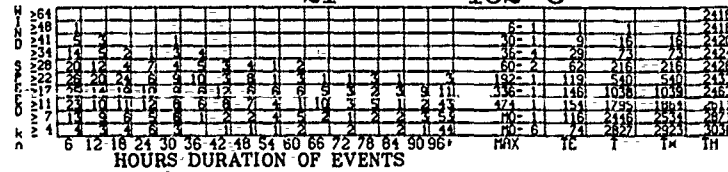
18 171-3



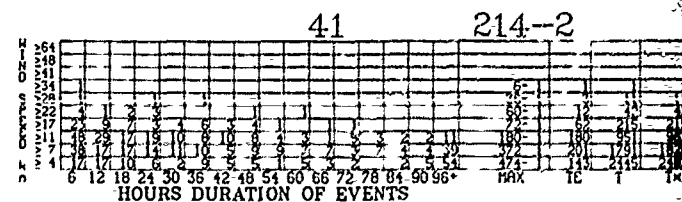
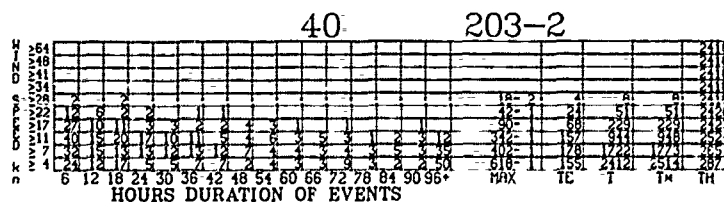
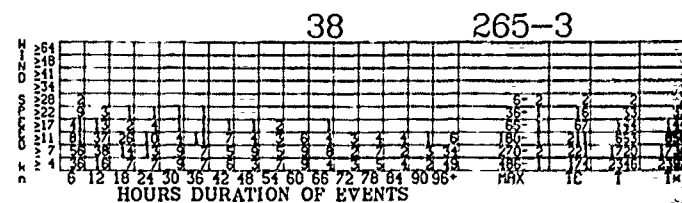
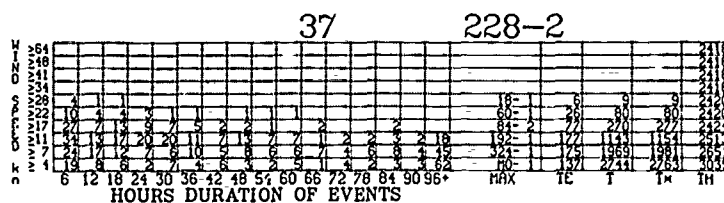
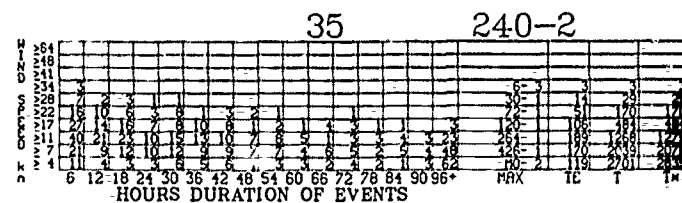
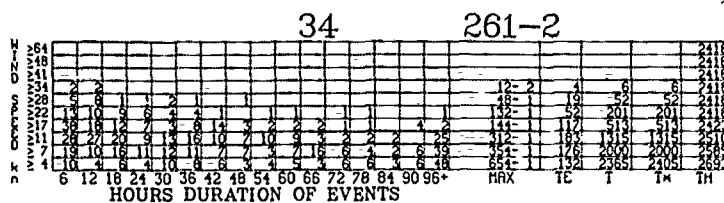
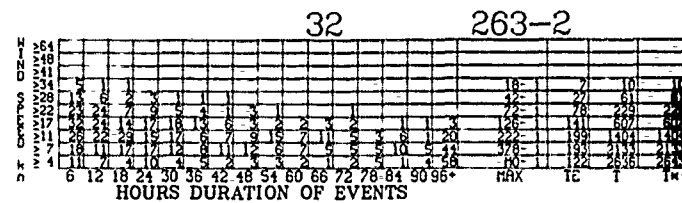
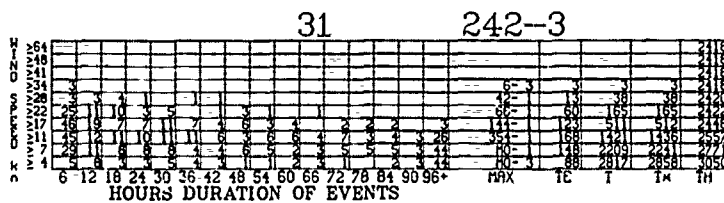
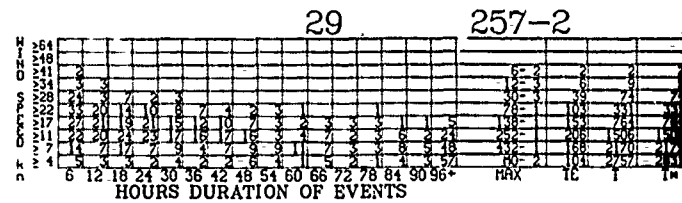
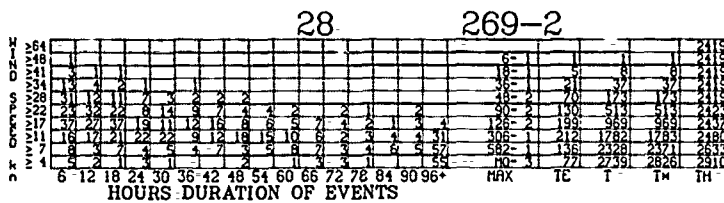
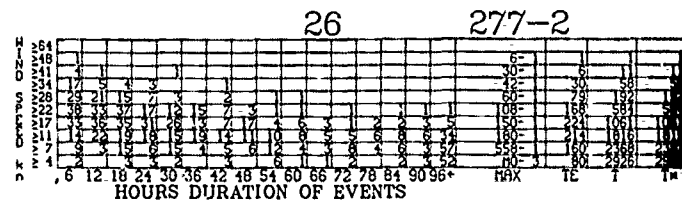
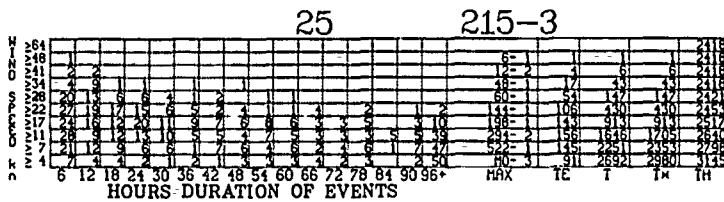
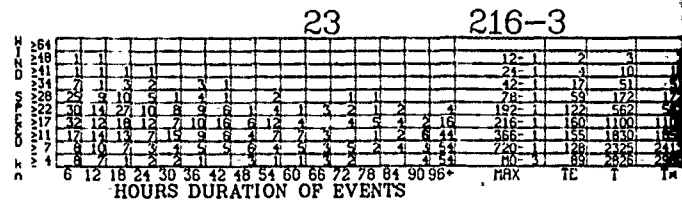
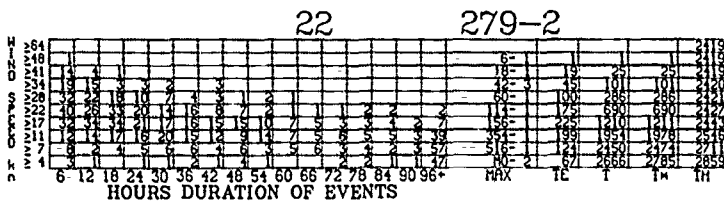
20 187-3



21 182-3



# WIND SPEED DURATIONS (Cont'd)

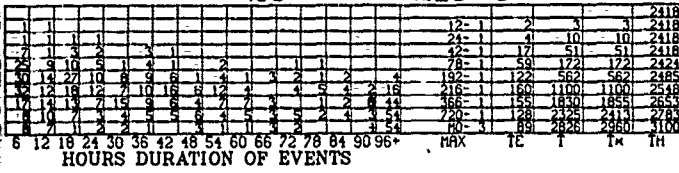


10

# OCTOBER

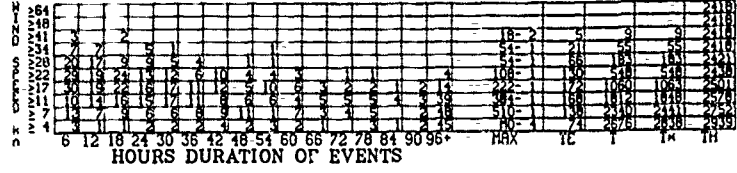
23

216-3



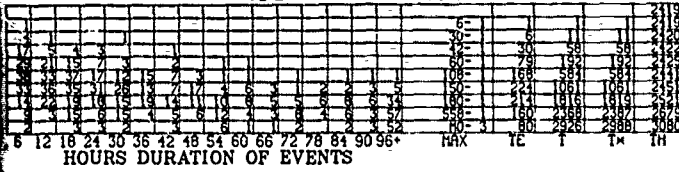
24

218-3



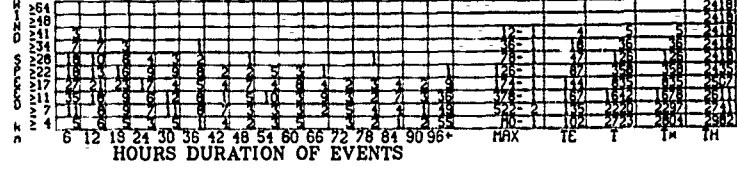
26

277-2



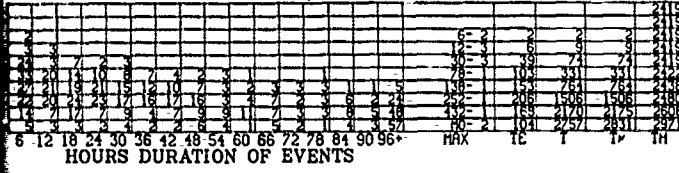
27

214-3



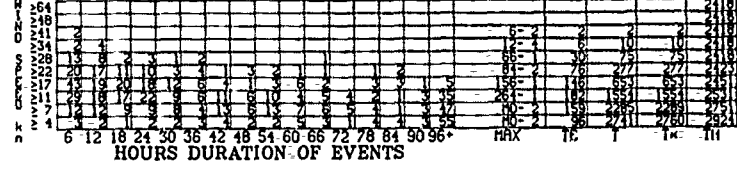
29

257-2



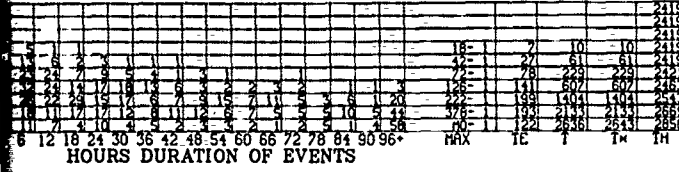
30

247-2



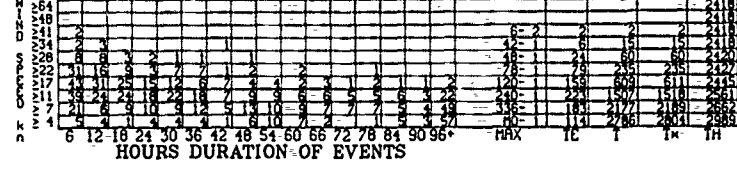
32

263-2



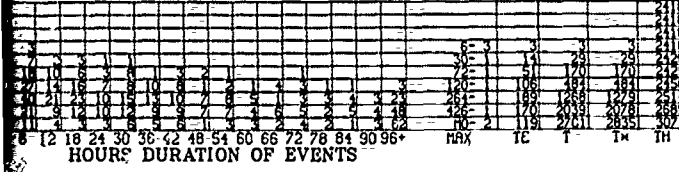
33

243-2



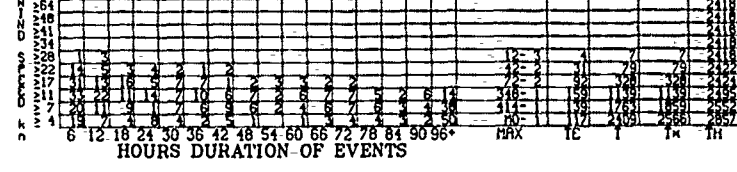
35

240-2



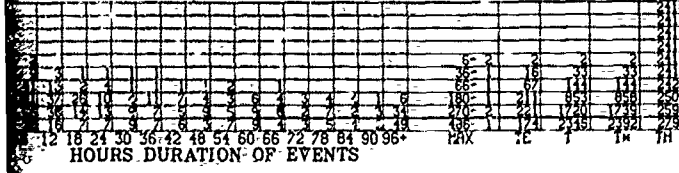
36

220-2



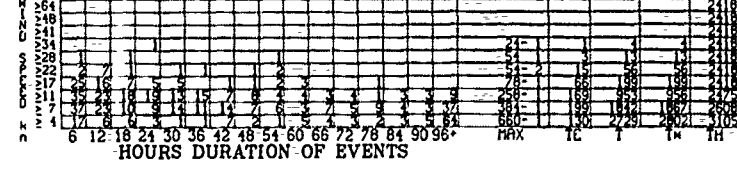
38

265-3



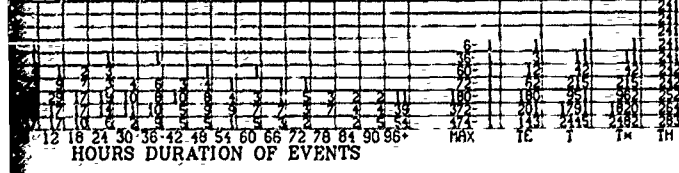
39

216-2



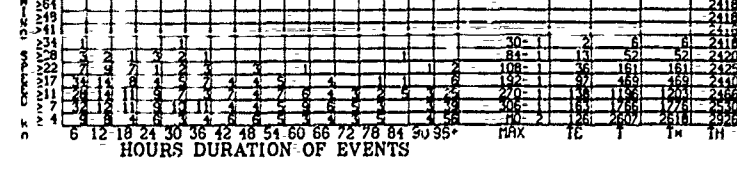
41

214-2



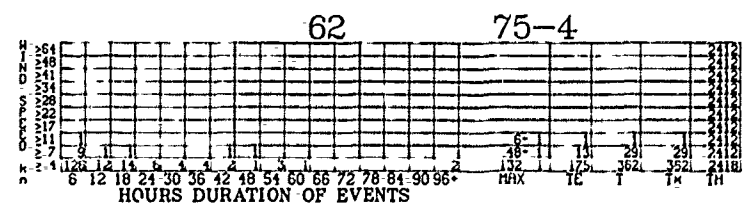
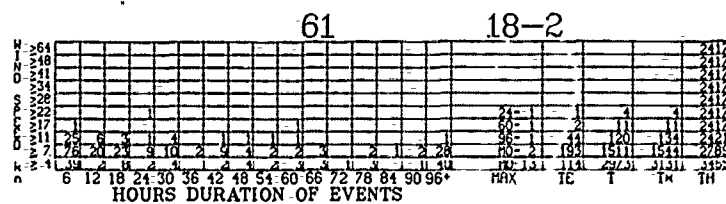
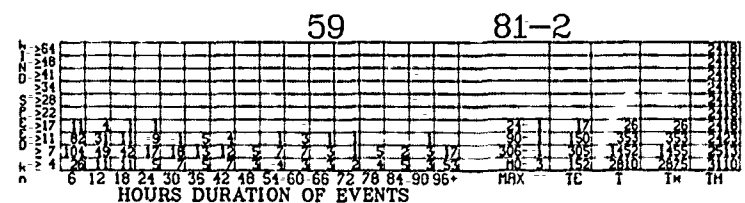
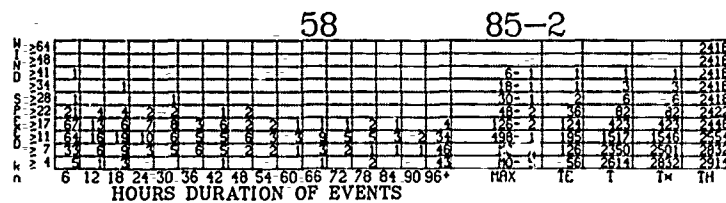
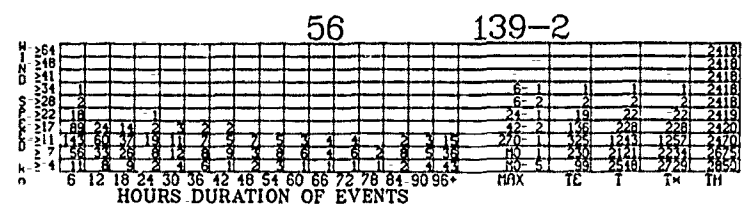
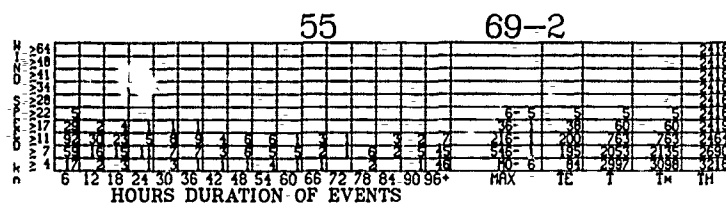
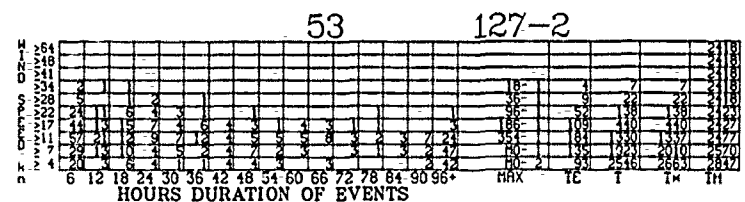
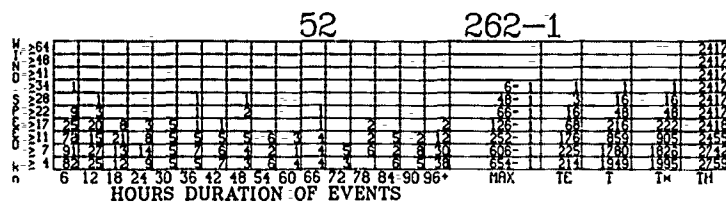
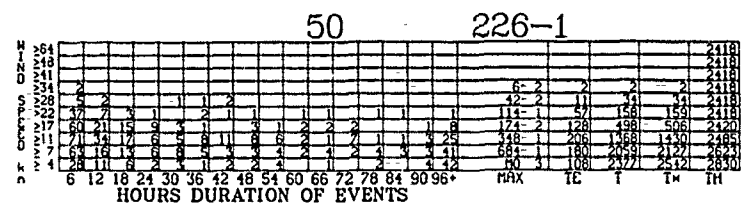
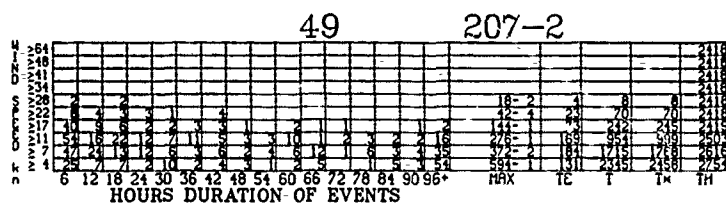
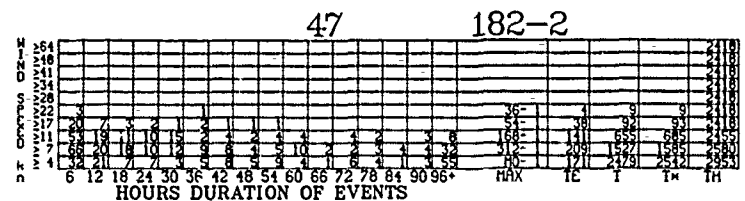
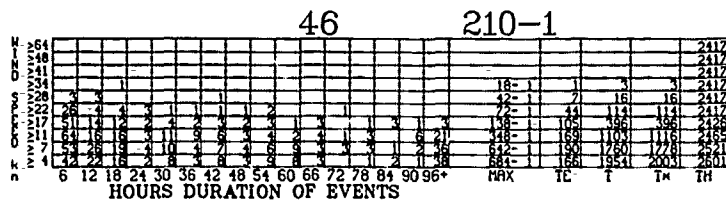
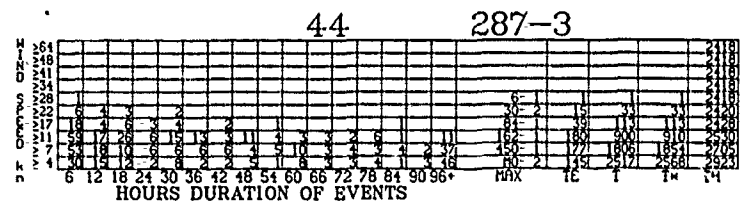
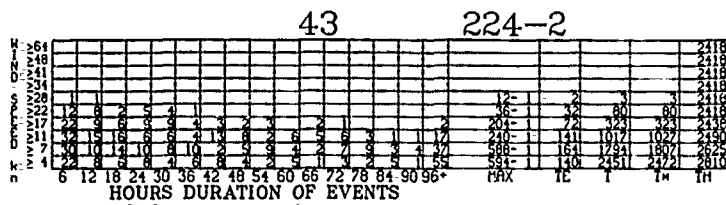
42

222-1

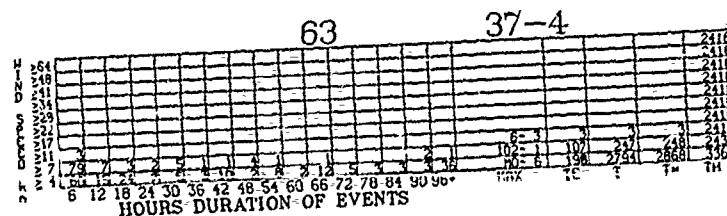
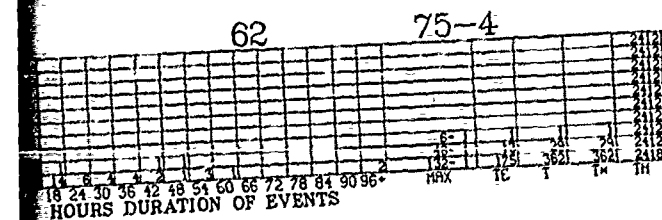
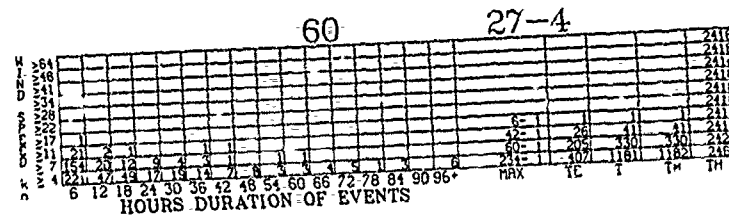
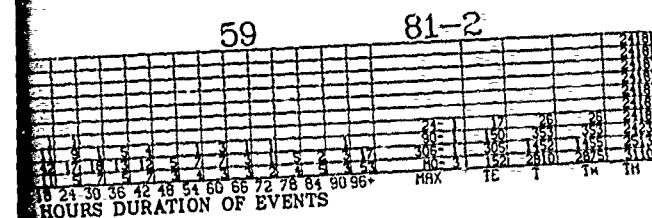
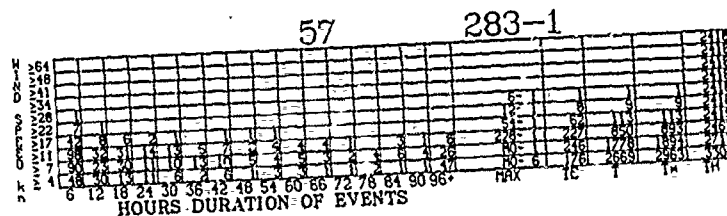
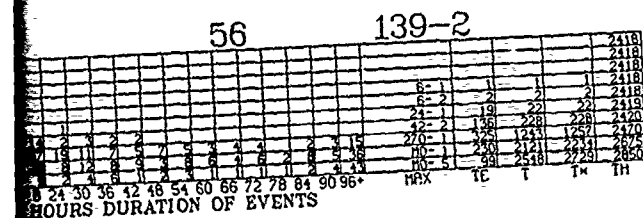
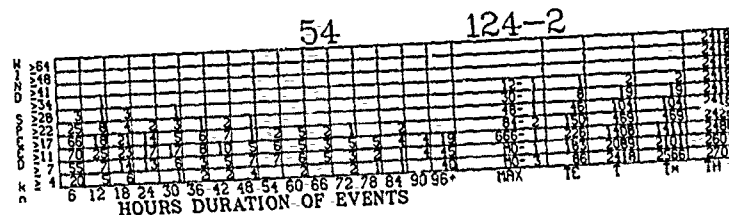
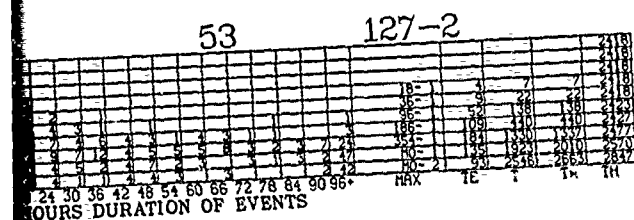
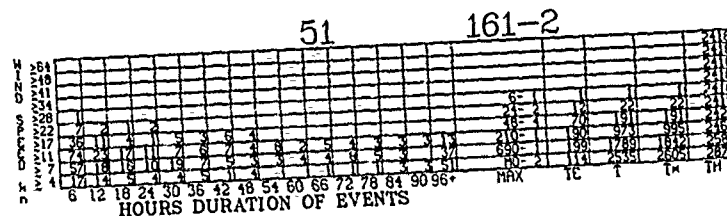
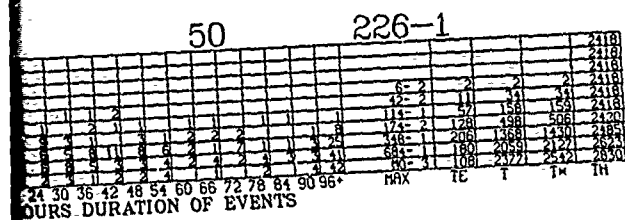
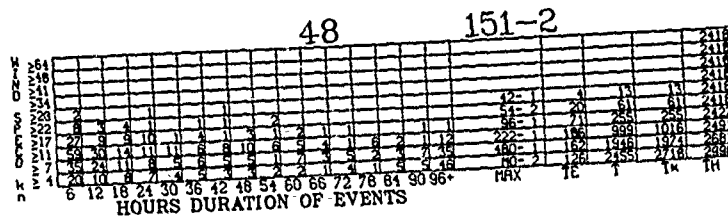
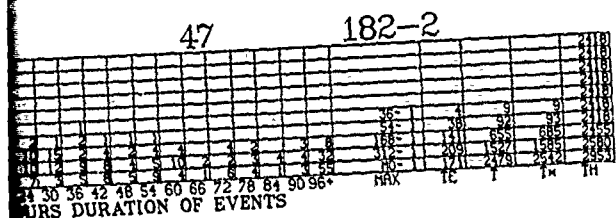
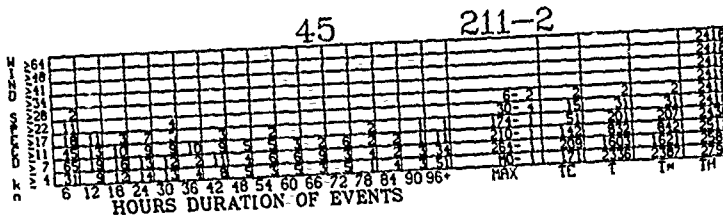
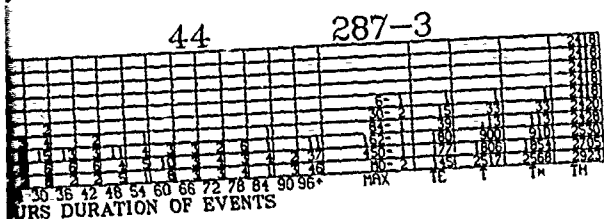


# OCTOBER

WIN

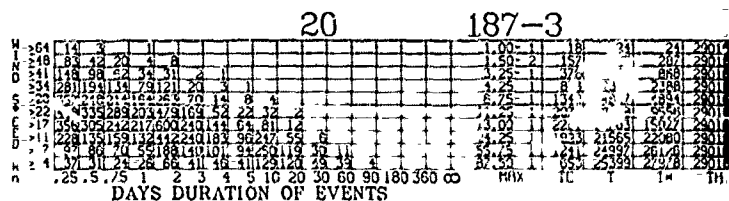
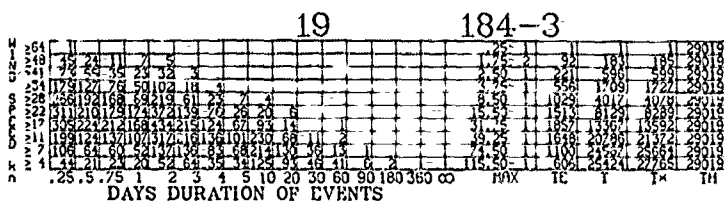
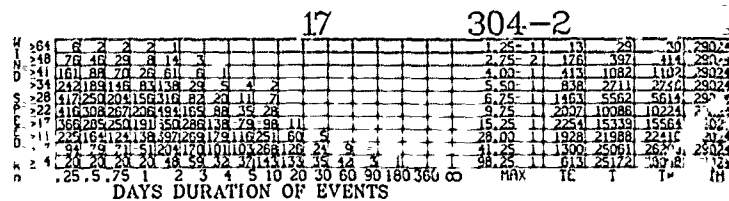
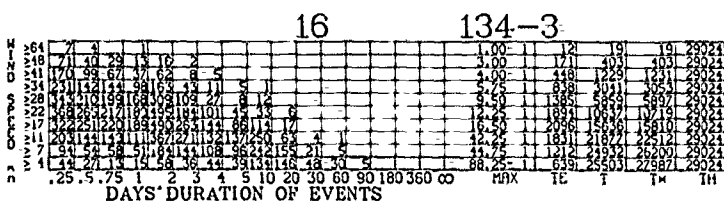
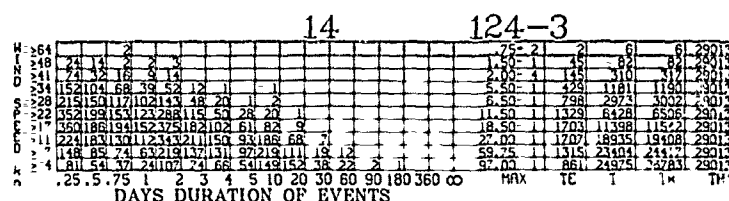
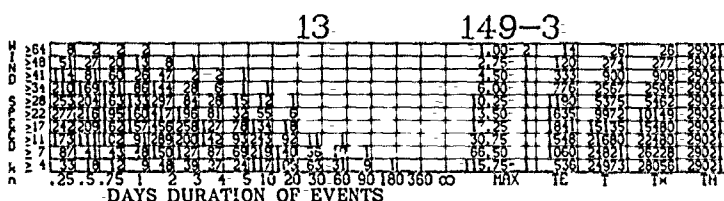
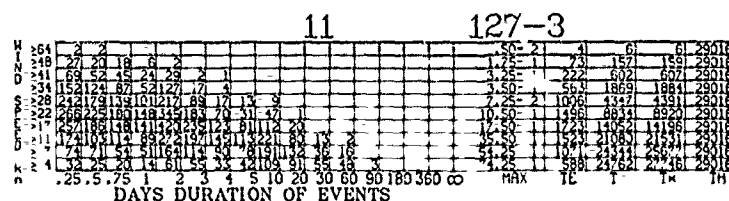
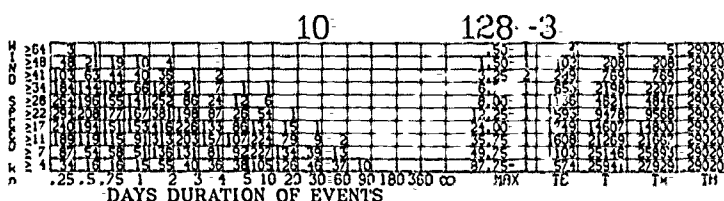
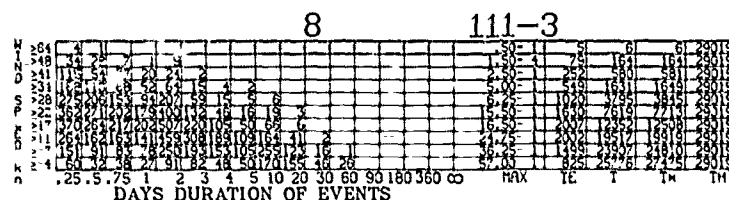
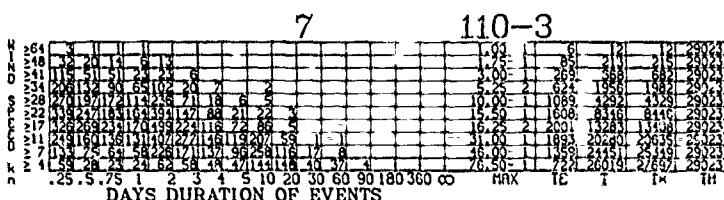
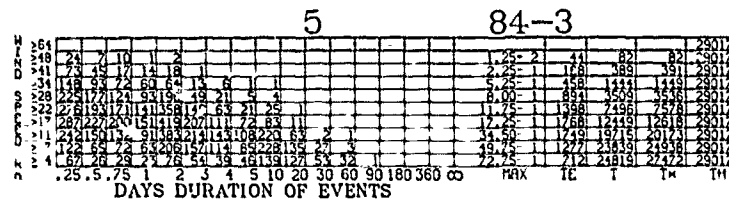
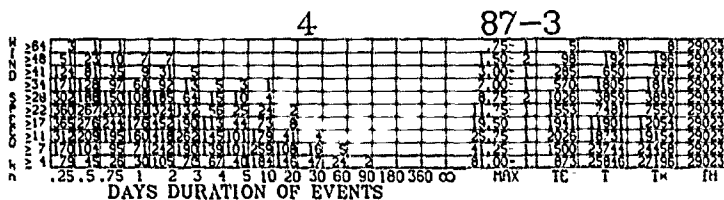
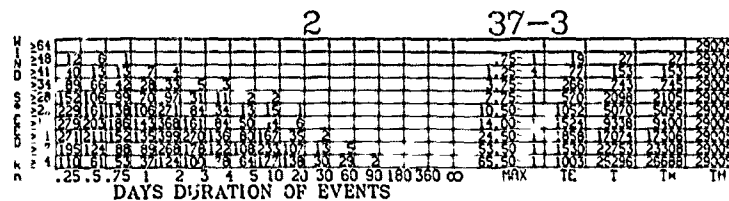
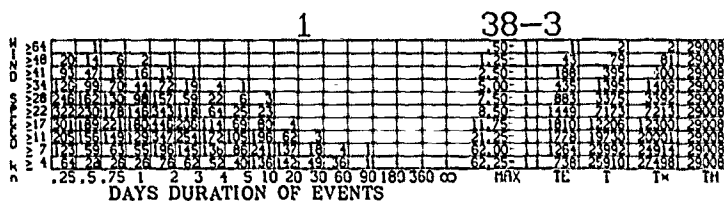


# WIND SPEED DURATIONS (Cont'd)





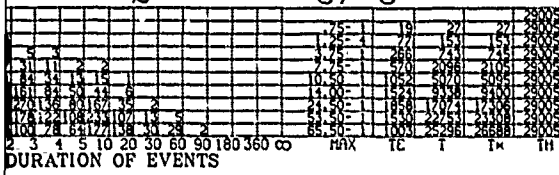
# WIND SPEED DURATIONS



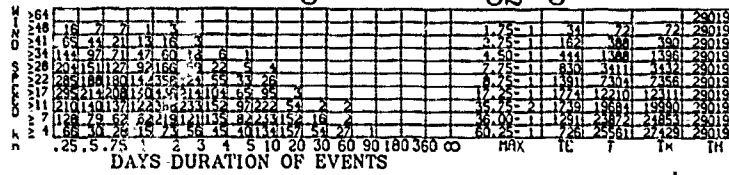
0

# ALL DAYS

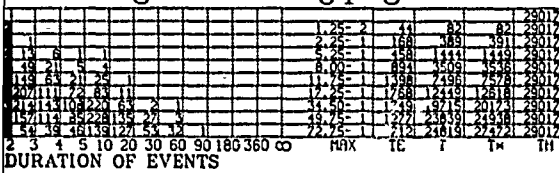
2 37-3



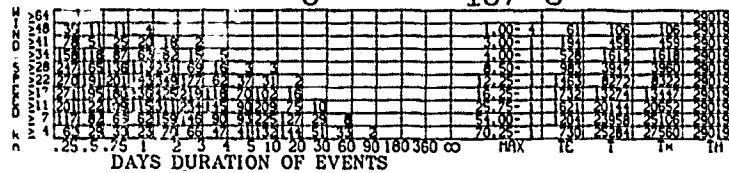
3 62-3



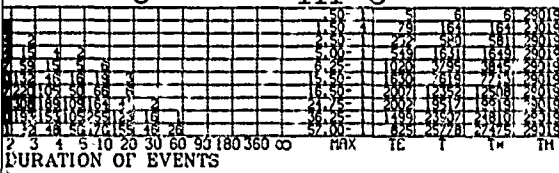
5 84-3



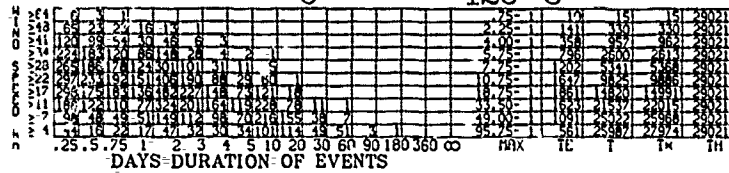
6 107-3



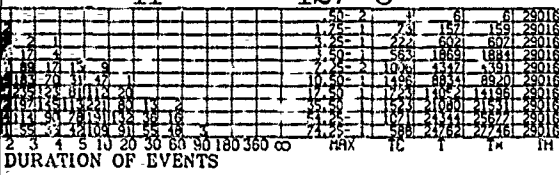
8 111-3



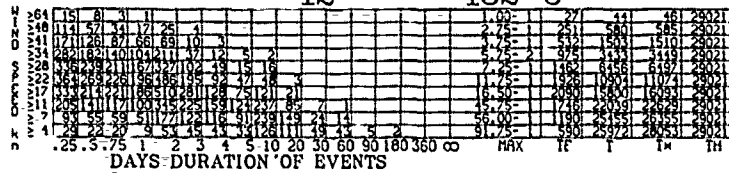
9 129-3



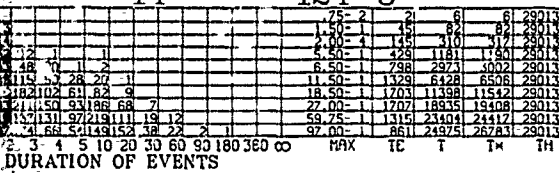
11 127-3



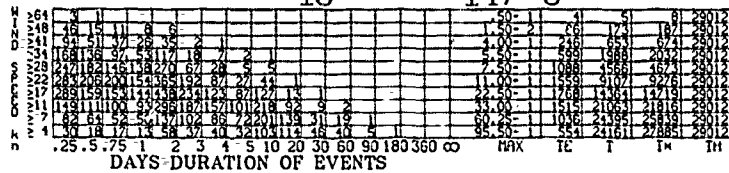
12 132-3



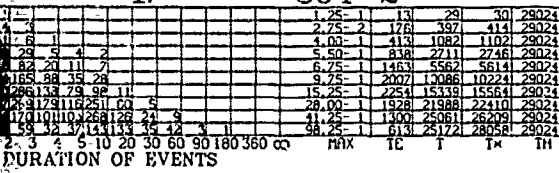
14 124-3



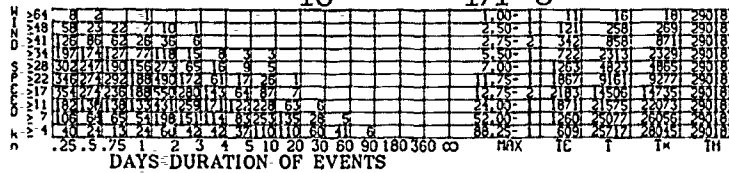
15 147-3



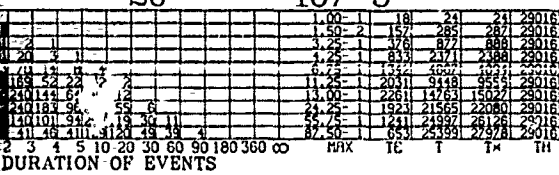
17 304-2



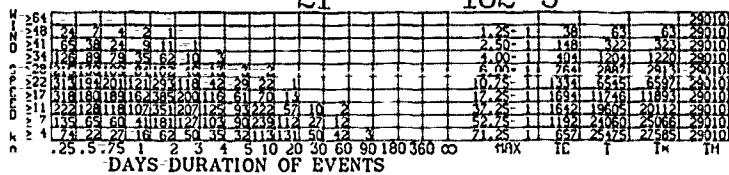
18 171-3



20 187-3



21 182-3

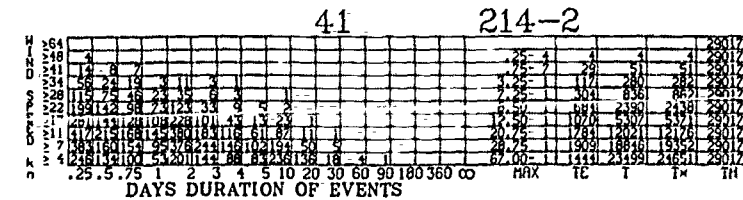
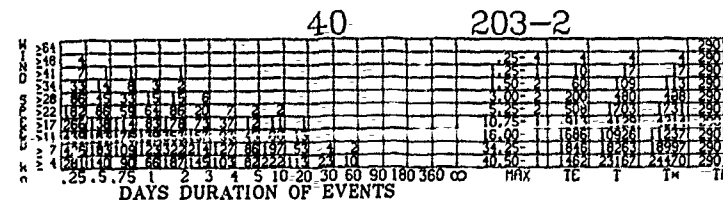
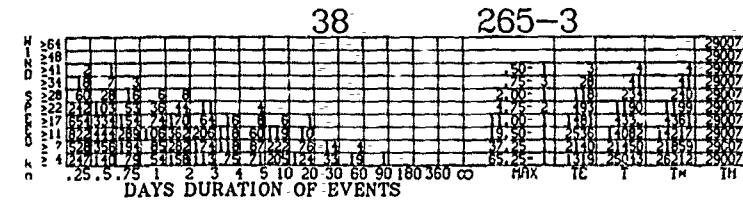
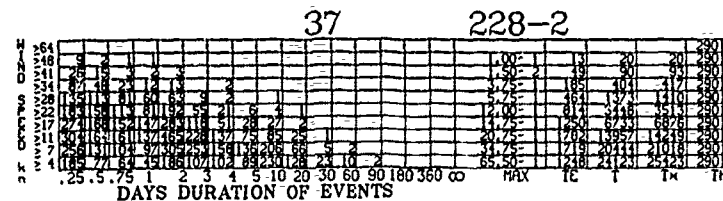
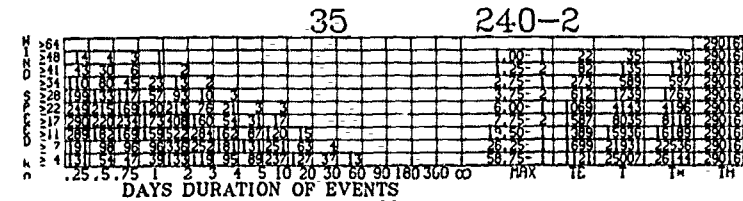
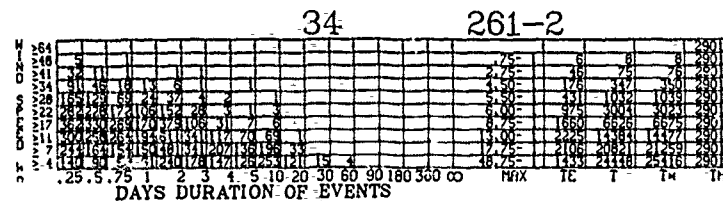
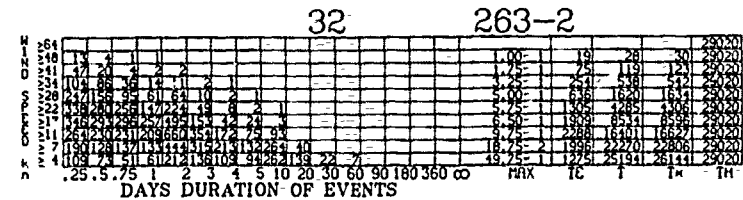
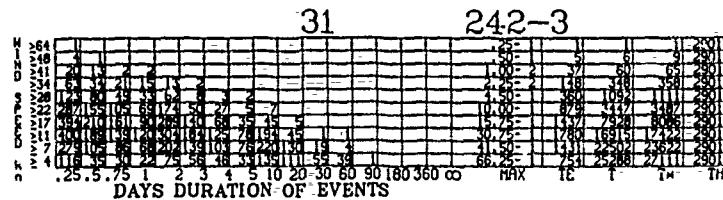
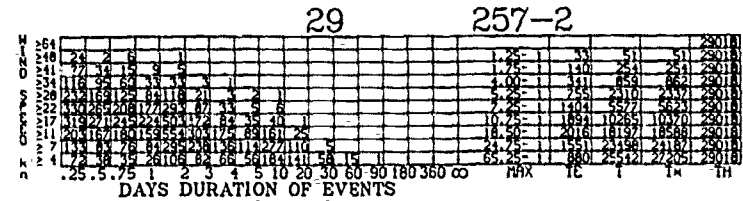
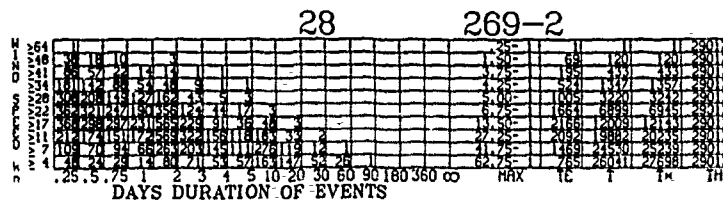
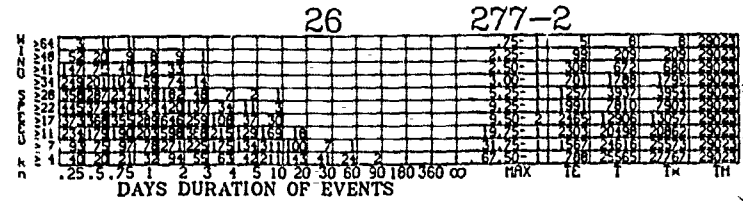
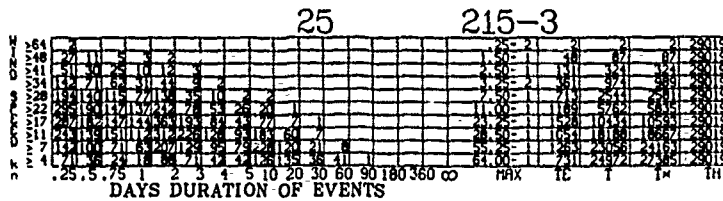
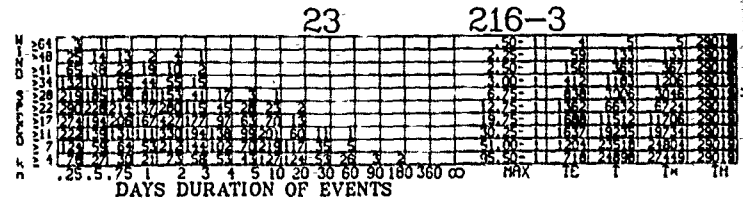
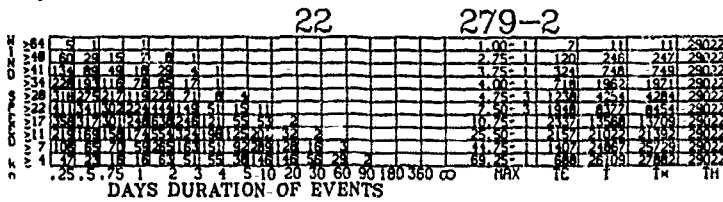


(2)



# ALL DAYS

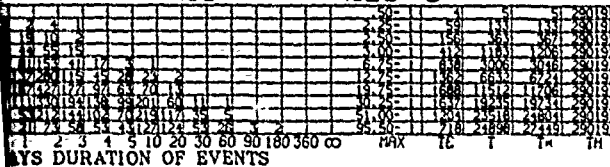
WII



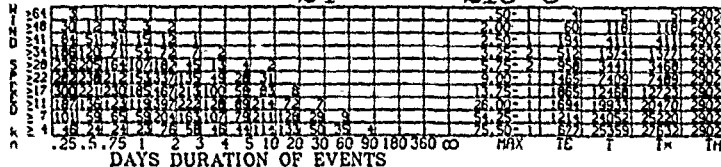
①

# WIND SPEED DURATIONS (Cont'd)

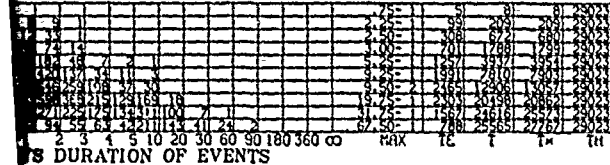
23 216-3



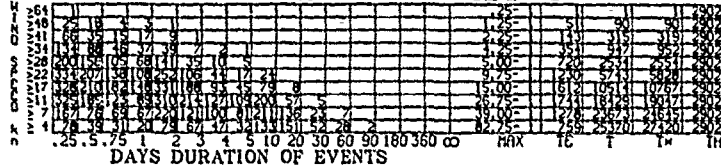
24 218-3



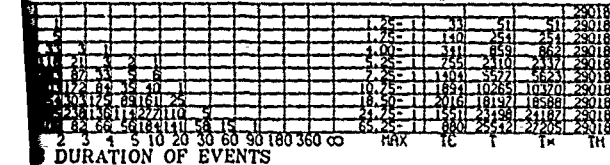
26 277-2



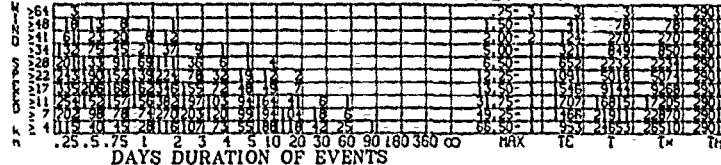
27 214-3



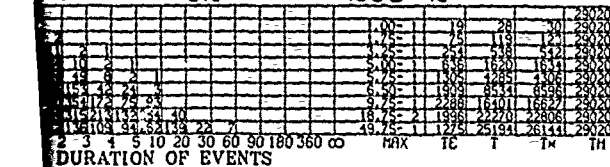
29 257-2



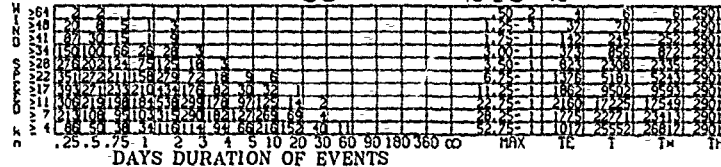
30 247-2



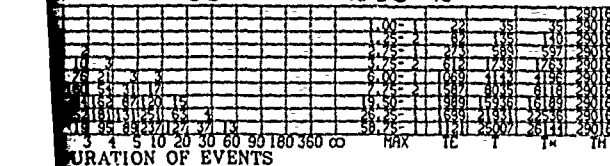
32 263-2



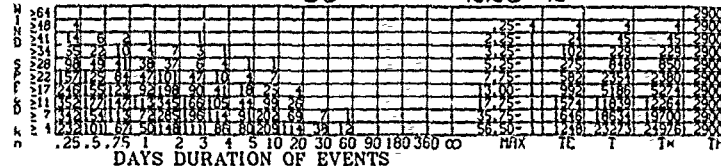
33 243-2



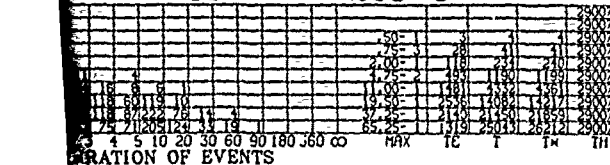
35 240-2



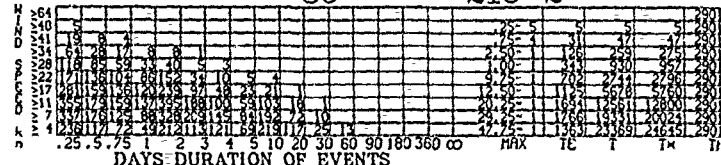
36 220-2



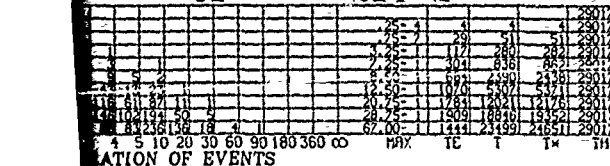
38 265-3



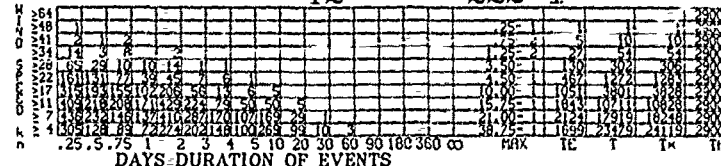
39 216-2



41 214-2

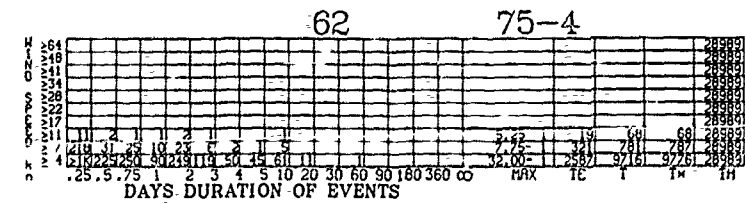
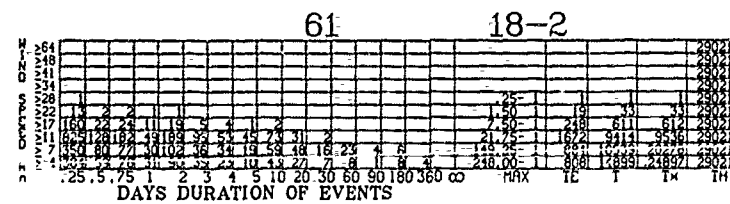
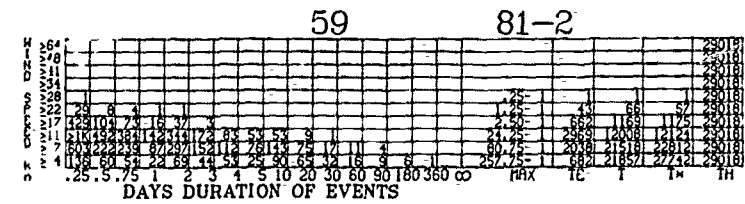
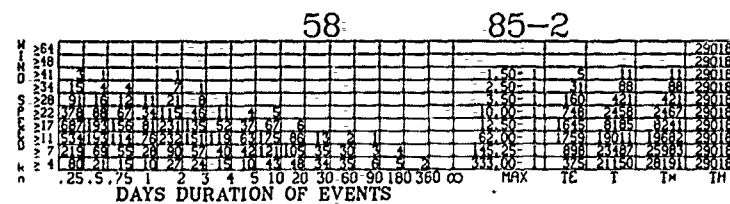
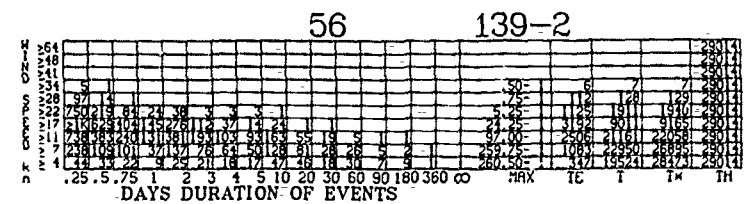
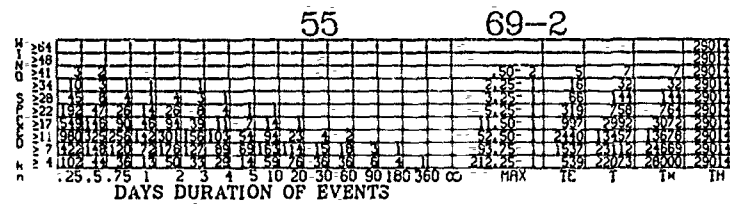
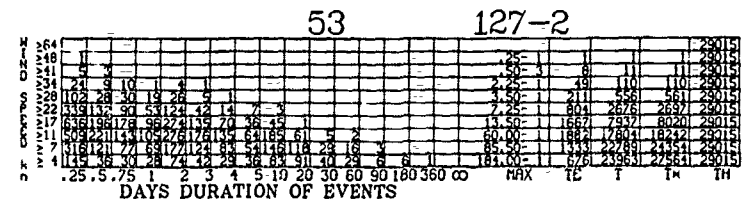
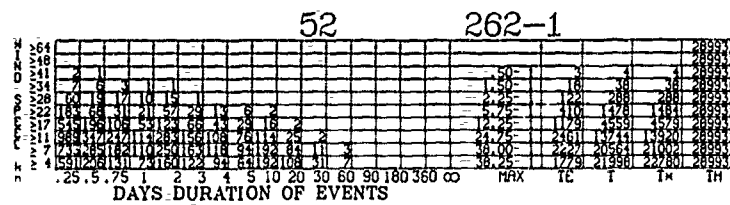
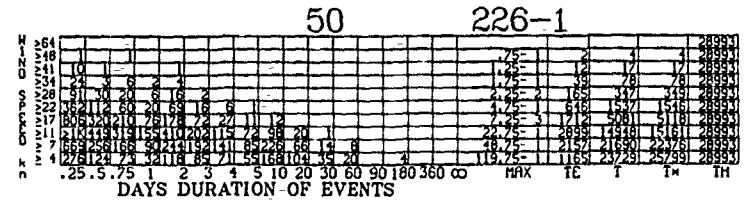
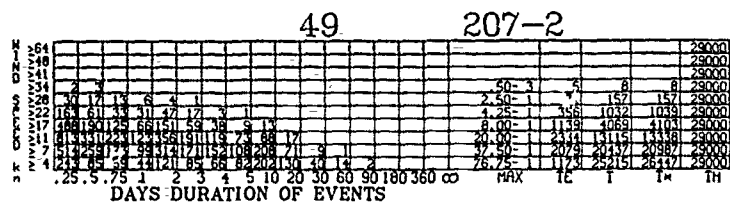
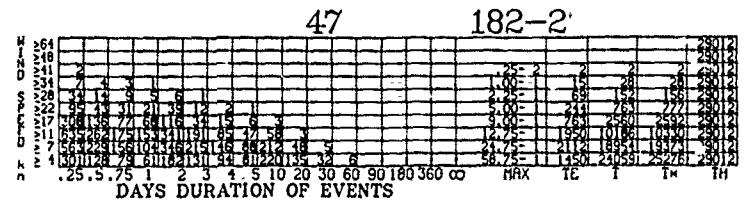
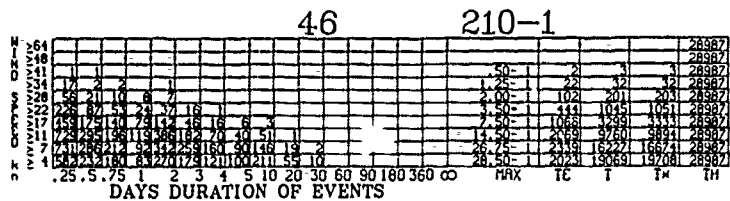
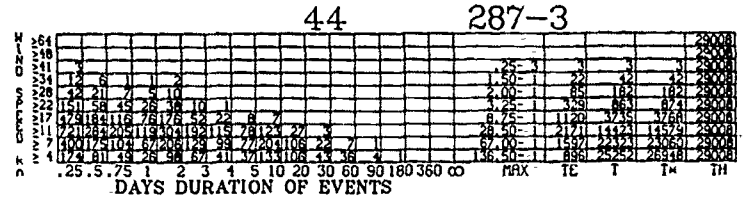
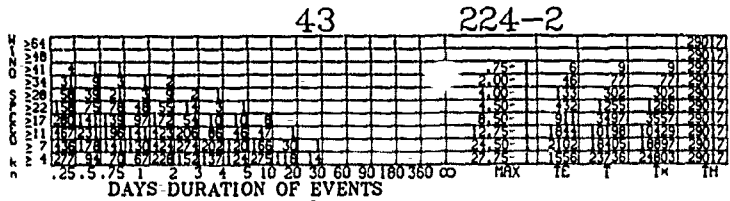


42 222-1



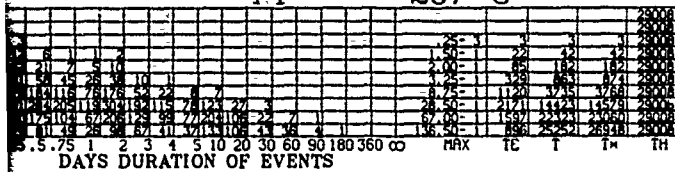
2

# WIND SPEED DURATIONS (Cont'd)

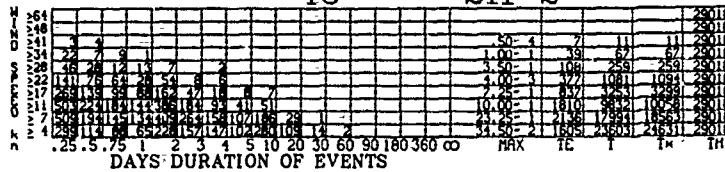


# ALL DAYS

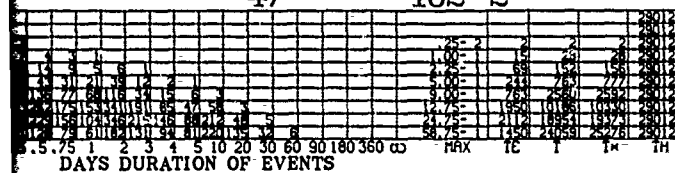
4.4 287-3



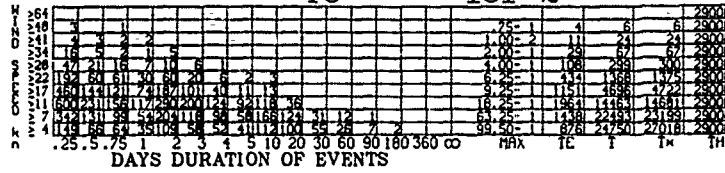
45 211-2



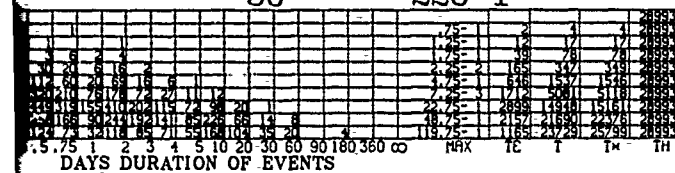
47 182-2



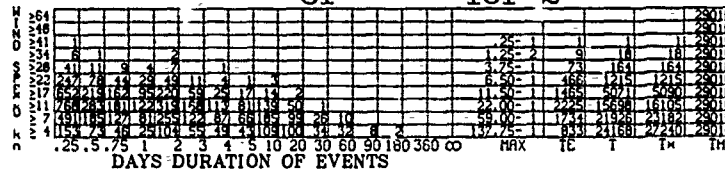
48 151-2



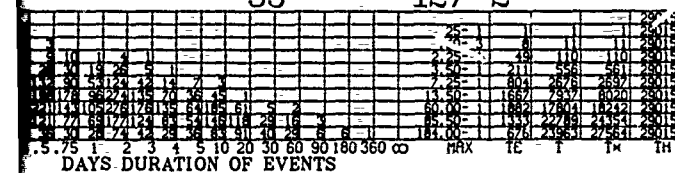
50 226-1



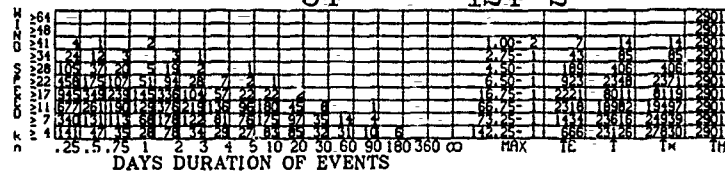
51 161-2



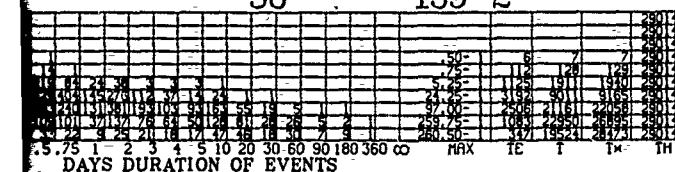
53 127-2



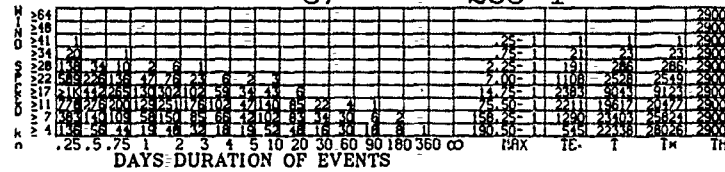
54 124-2



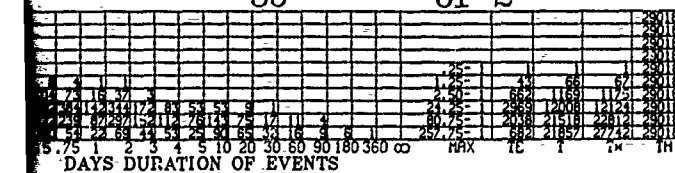
56 139-2



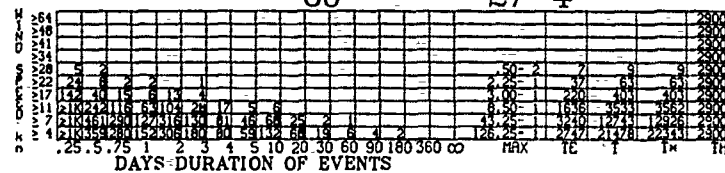
57 283-1



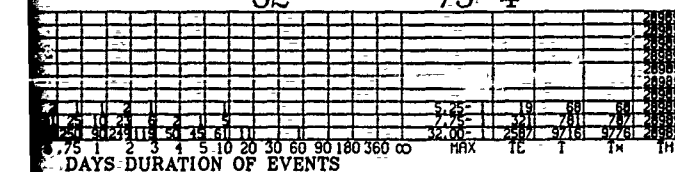
59 81-2



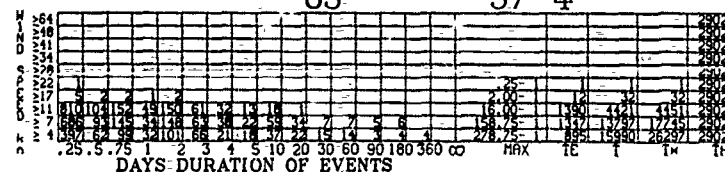
60 27-4



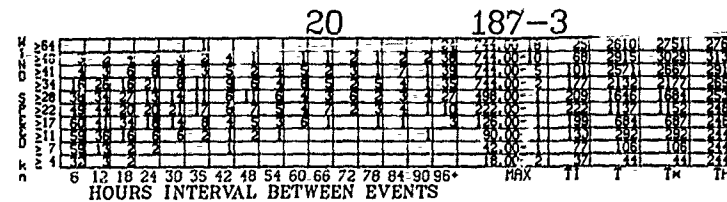
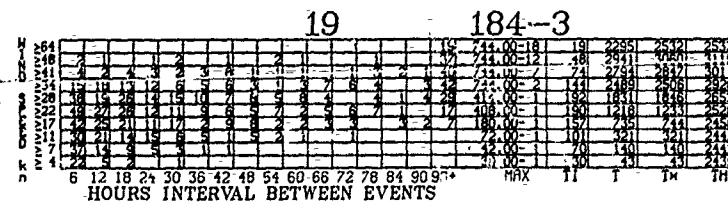
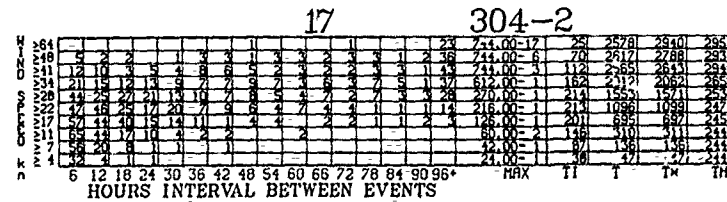
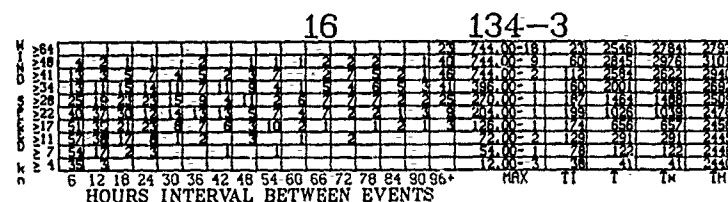
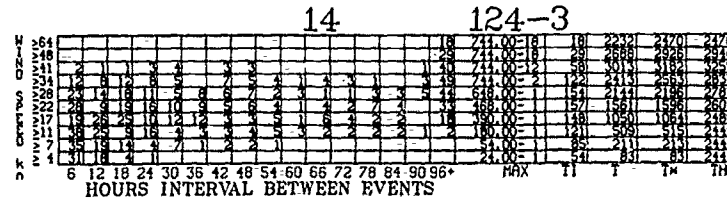
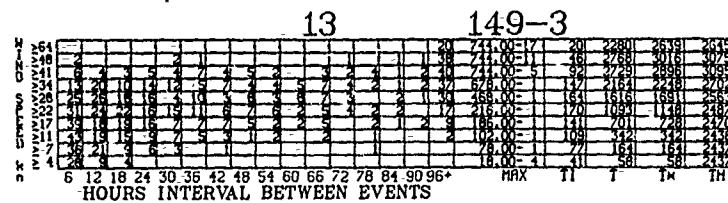
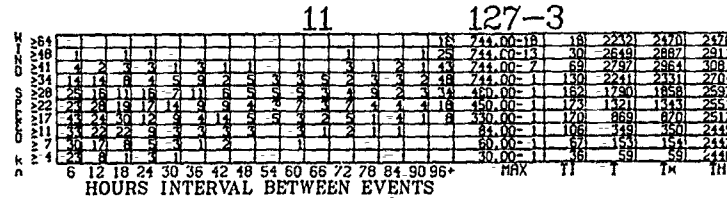
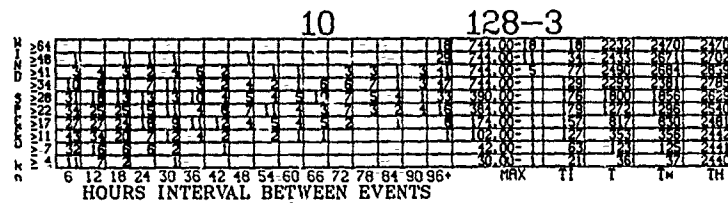
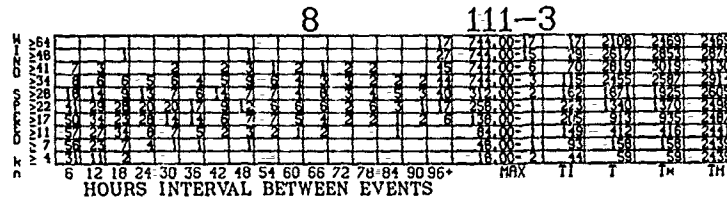
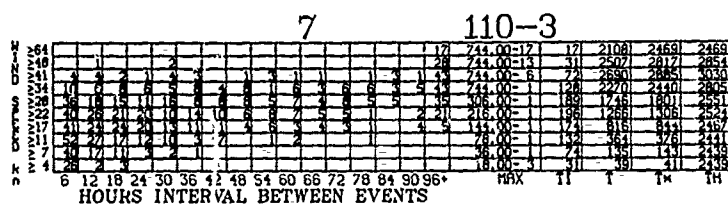
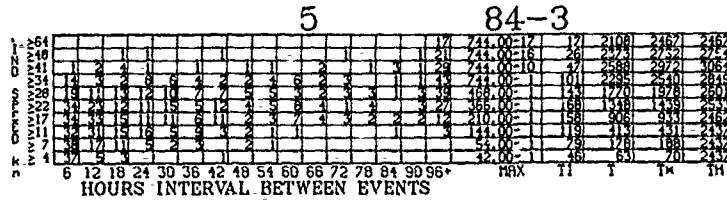
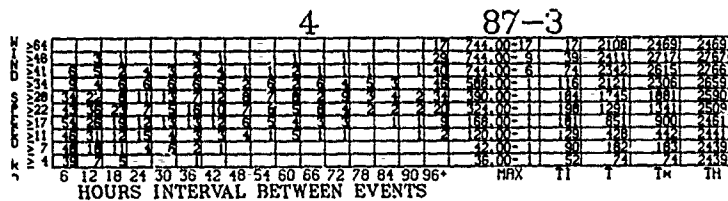
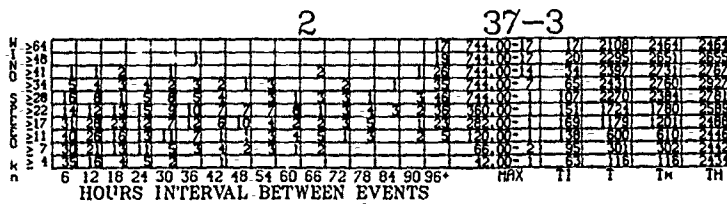
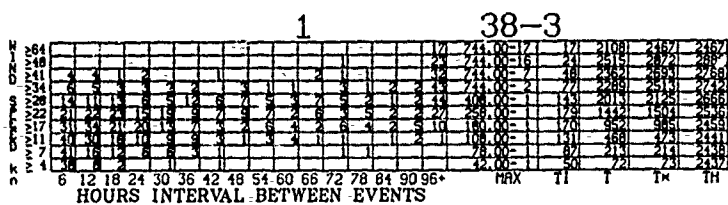
62 75-4



63 37-4



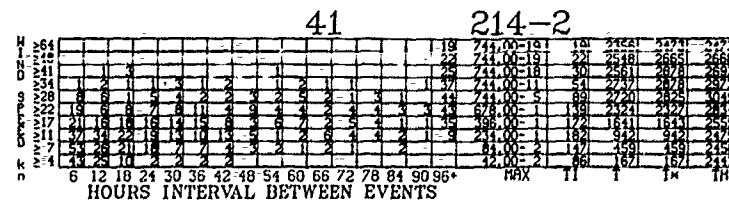
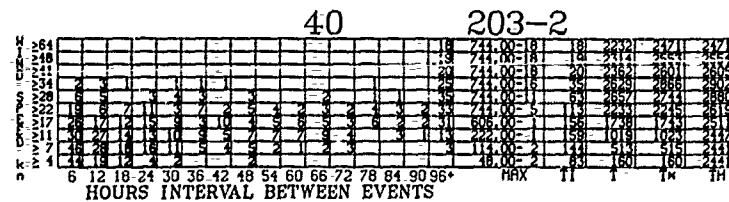
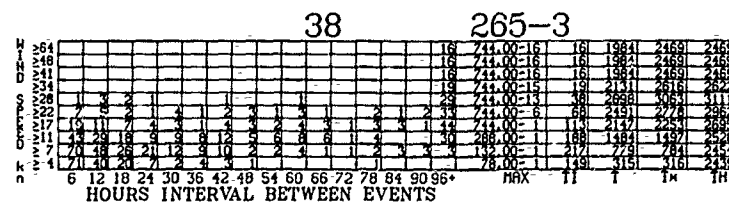
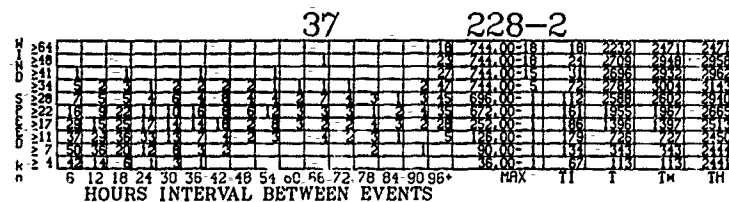
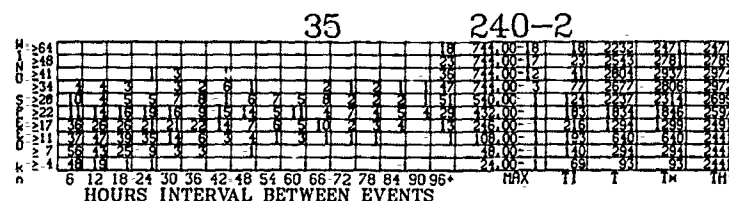
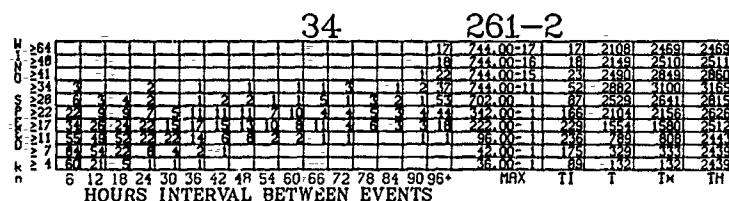
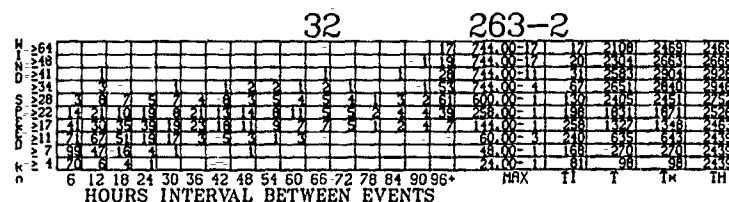
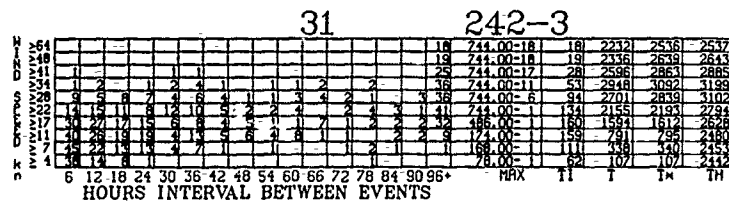
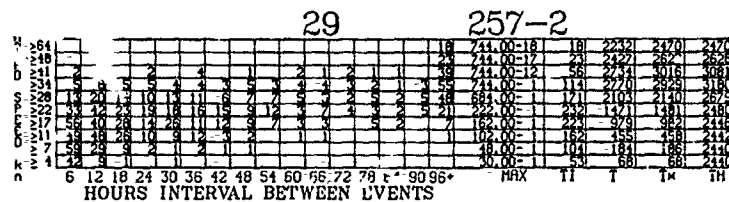
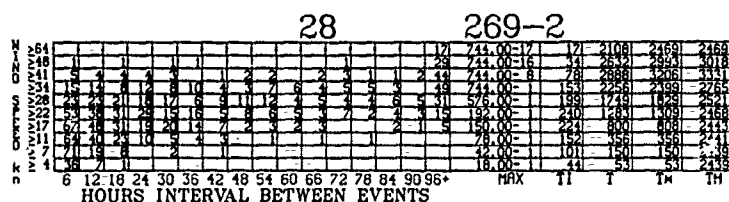
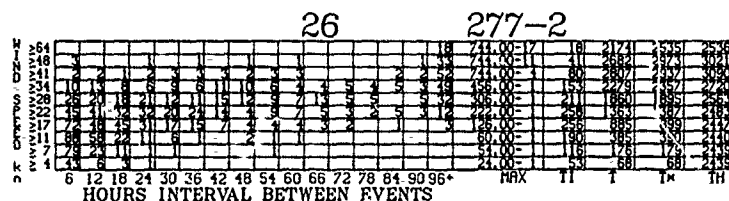
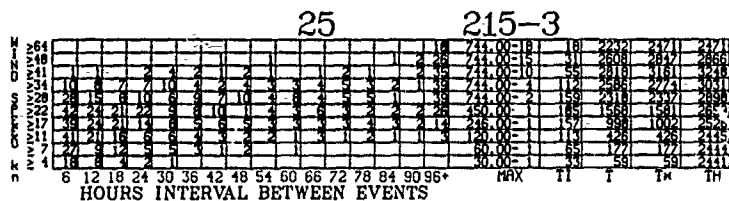
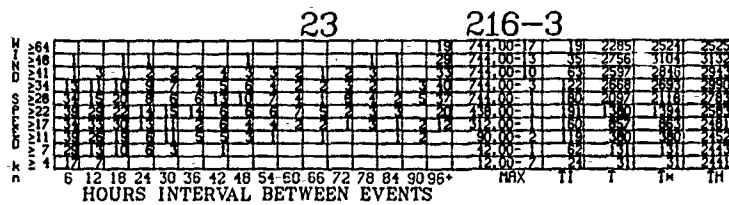
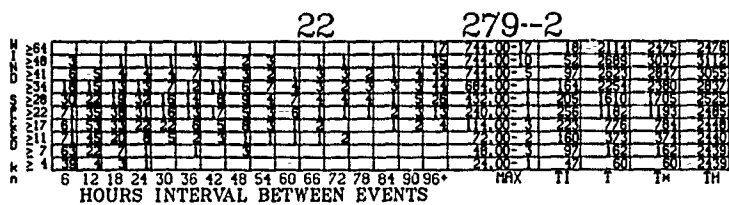
# JANUARY







# WIND SPEED INTERVALS (Cont'd)

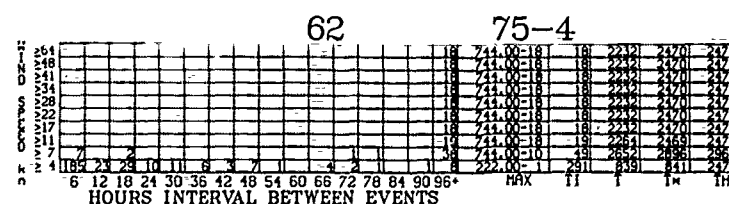
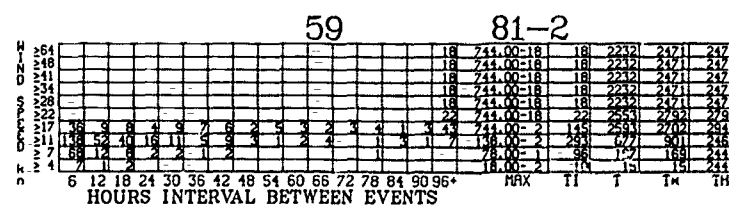
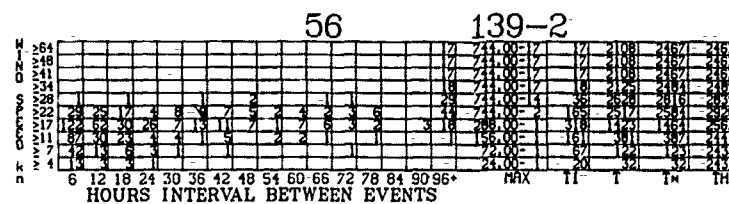
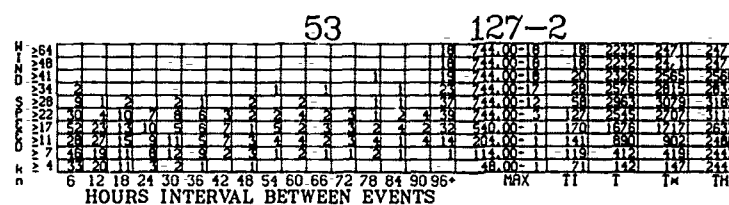
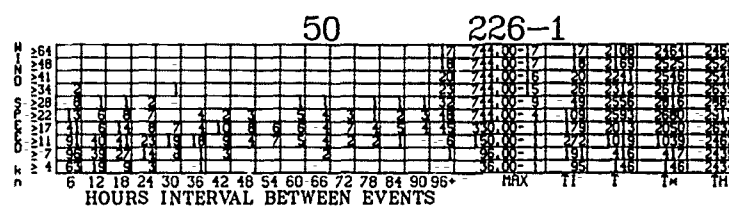
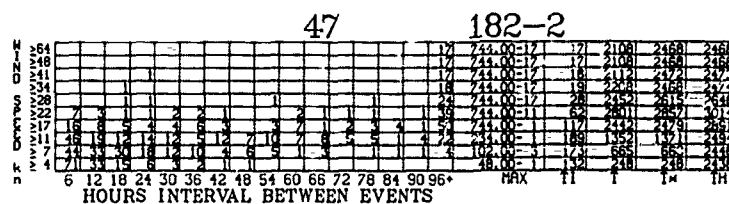
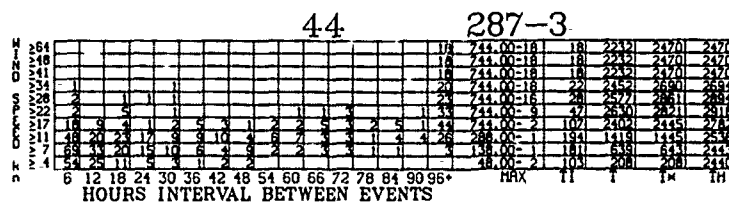
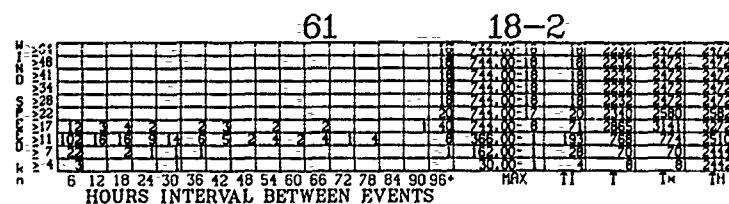
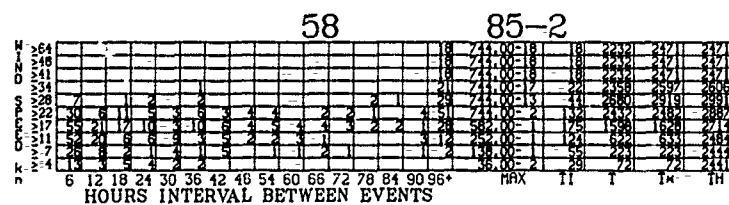
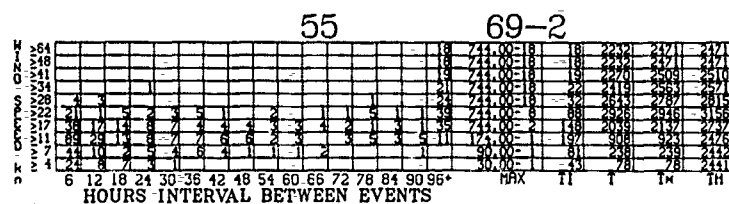
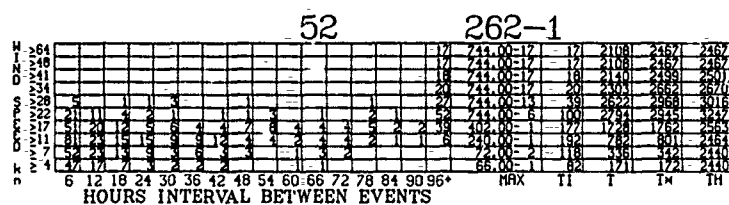
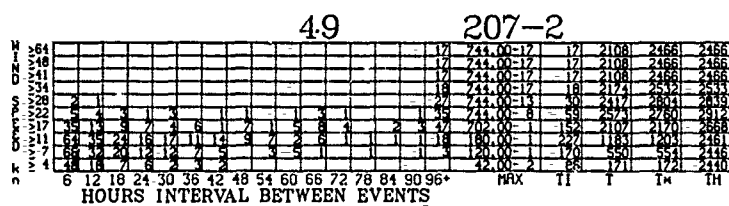
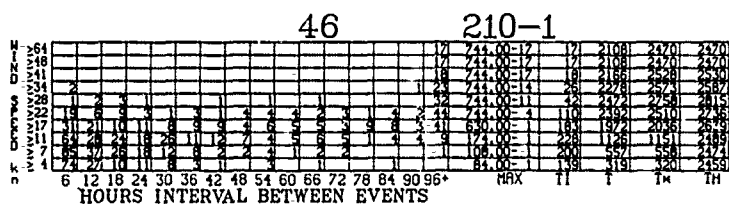
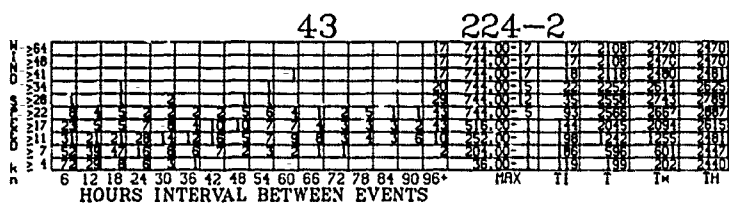






# JANUARY

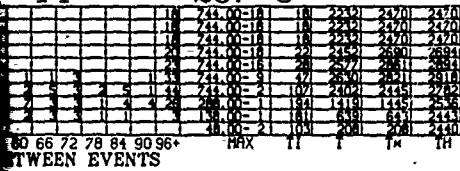
WII



# WIND SPEED INTERVALS (Cont'd)

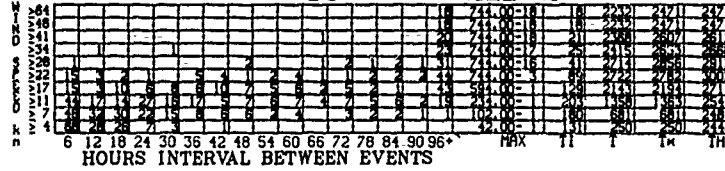
44

287-3



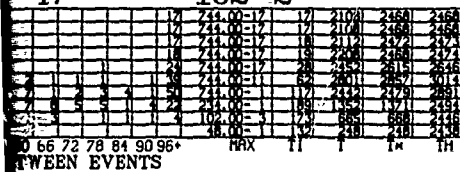
45

211-2



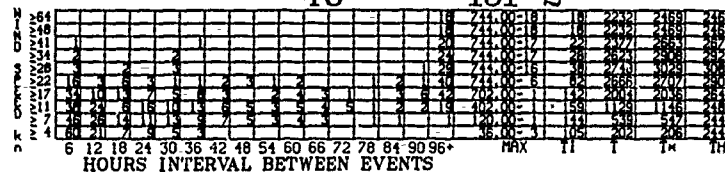
47

182-2



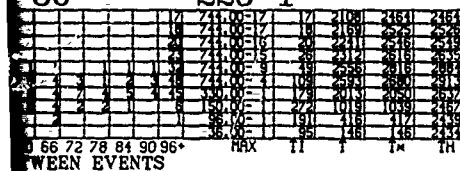
48

151-2



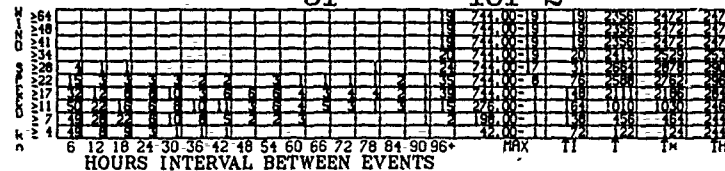
50

226-1



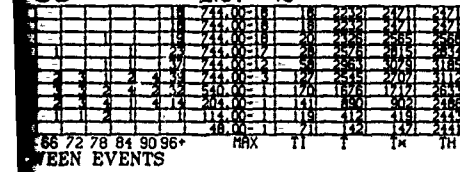
51

161-2



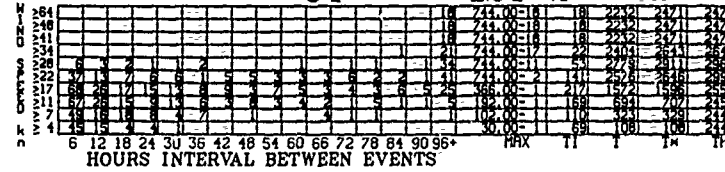
53

127-2



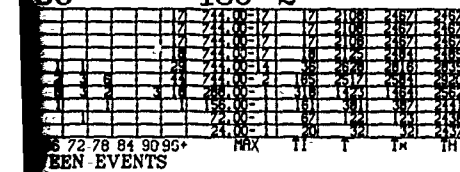
54

124-2



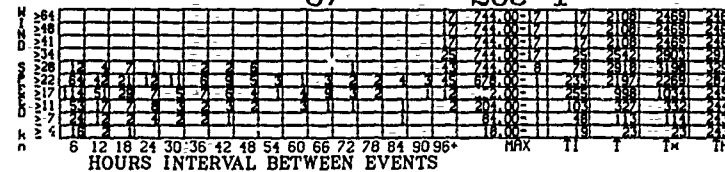
56

139-2



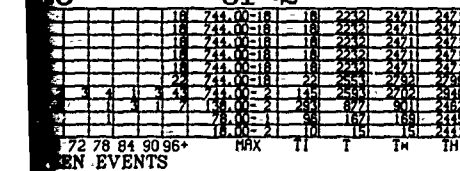
57

283-1



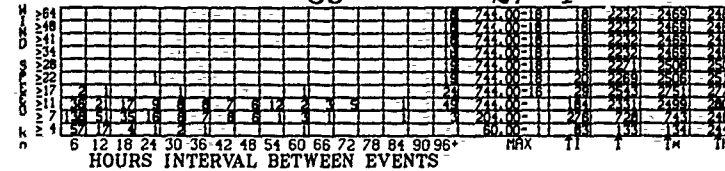
59

81-2



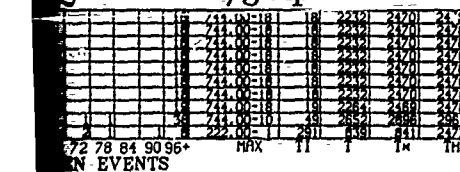
60

27-4



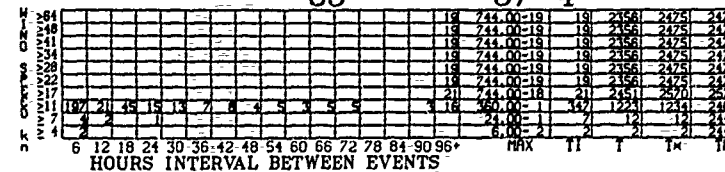
62

75-4



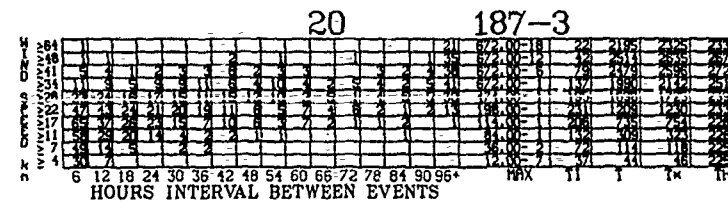
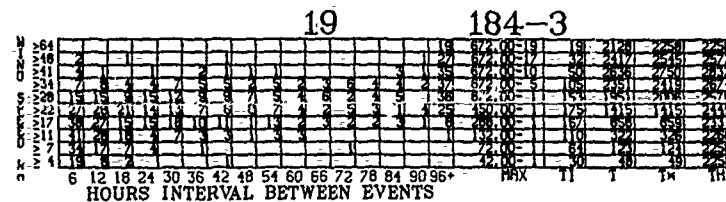
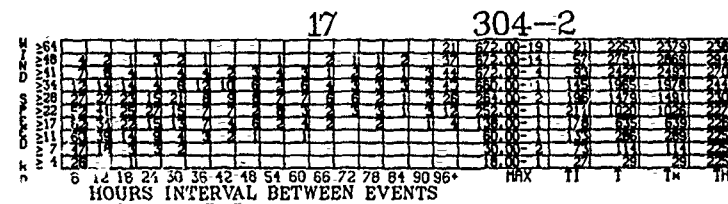
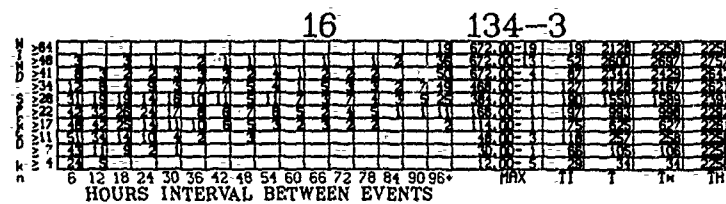
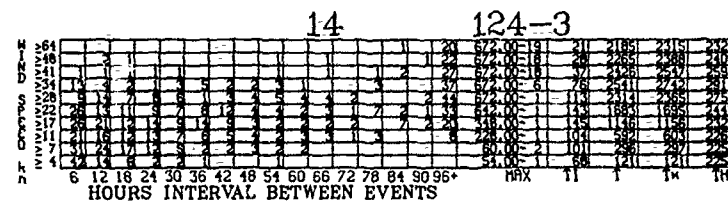
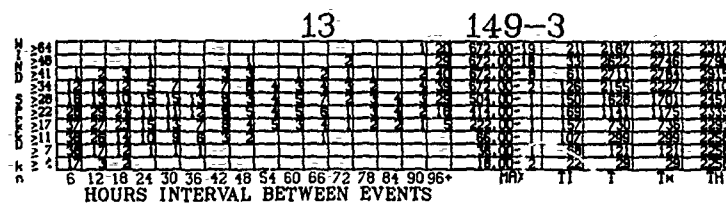
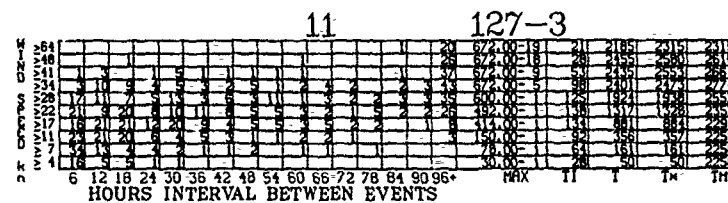
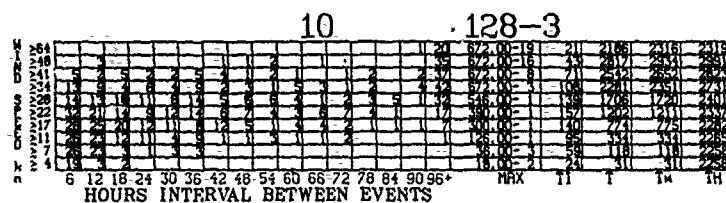
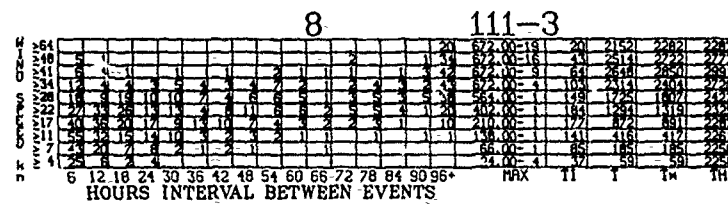
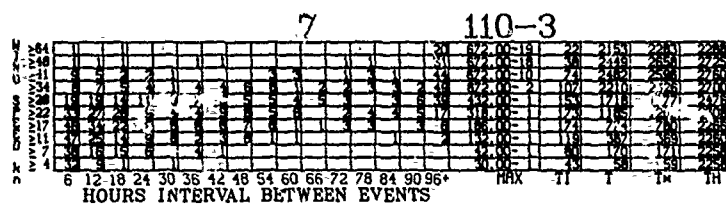
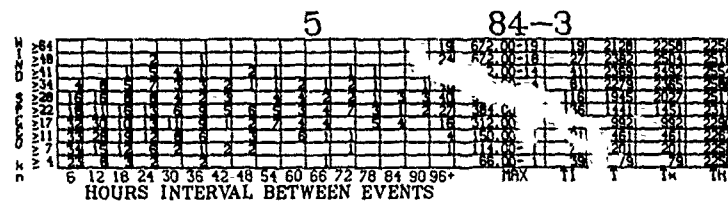
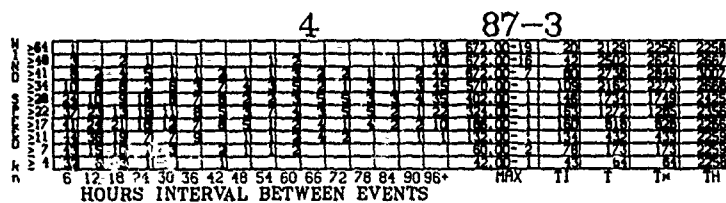
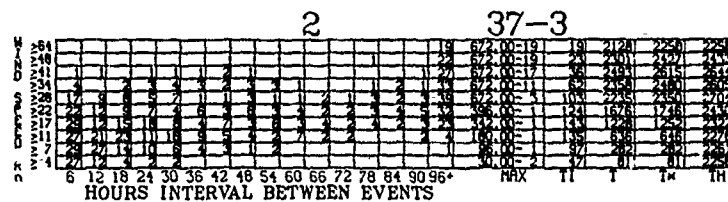
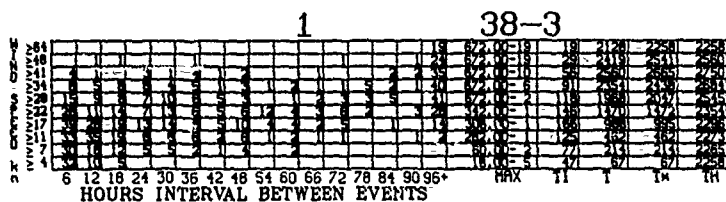
63

37-4



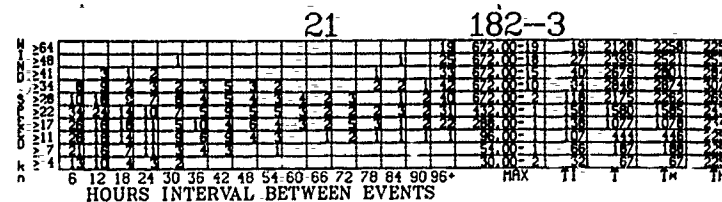
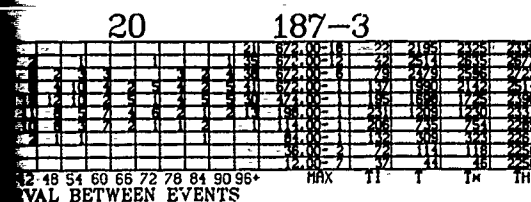
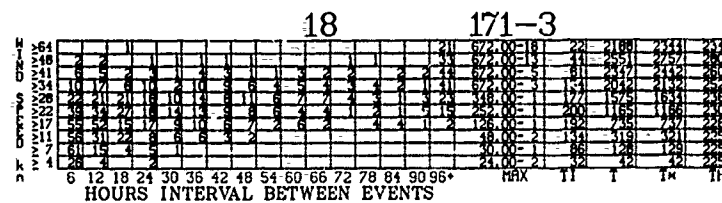
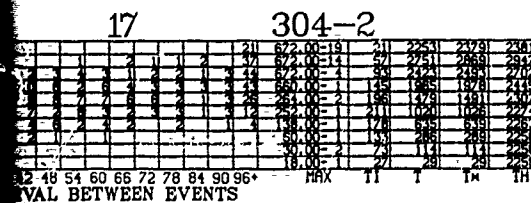
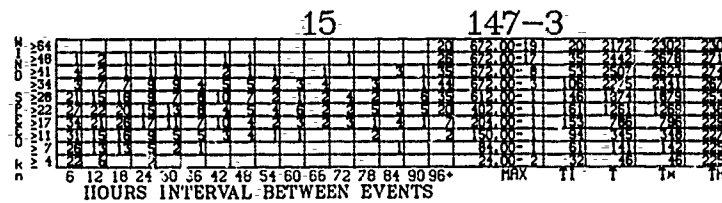
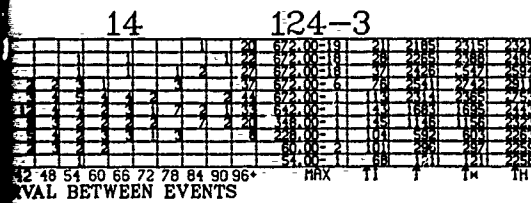
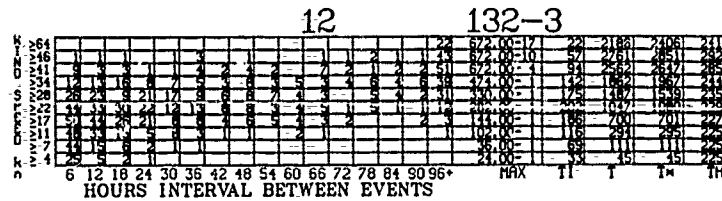
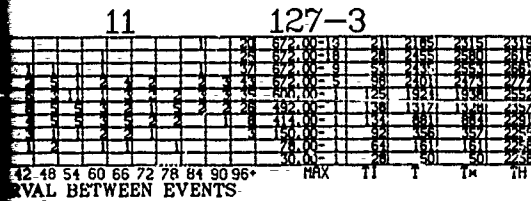
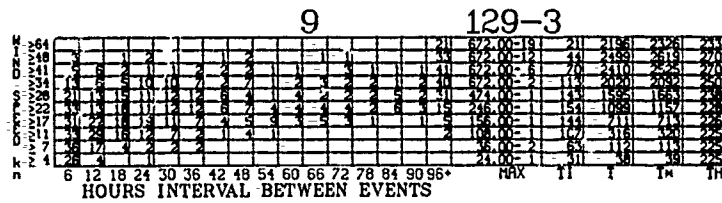
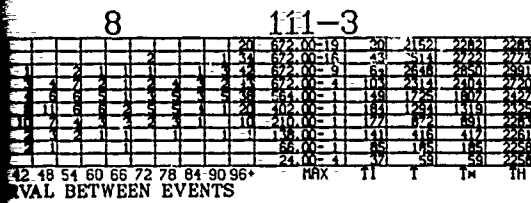
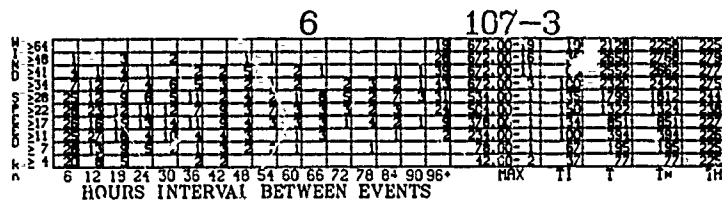
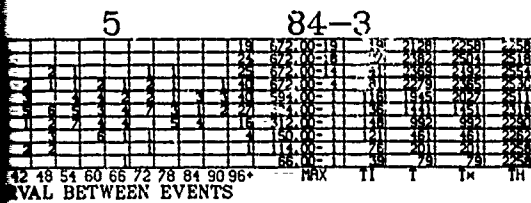
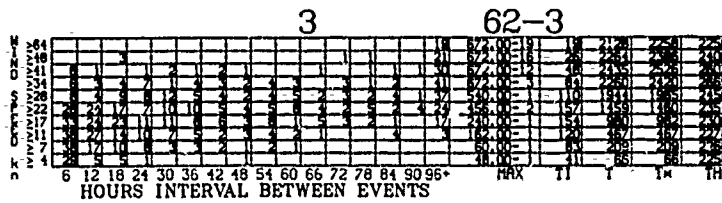
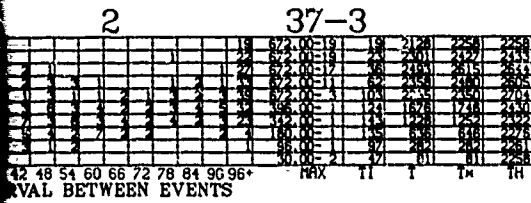
2

# WIND SPEED INTERVALS



①

# FEBRUARY

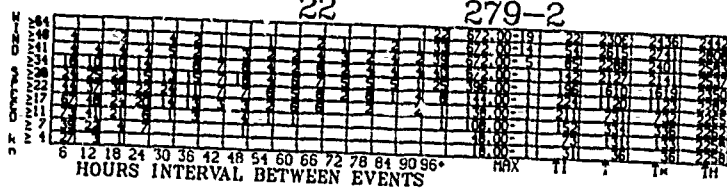




# FEBRUARY

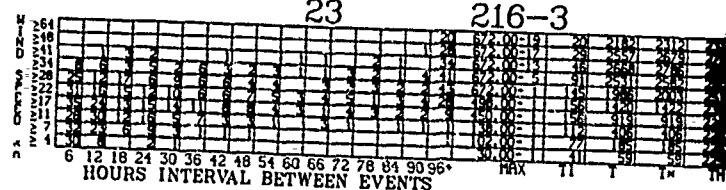
22

279-2



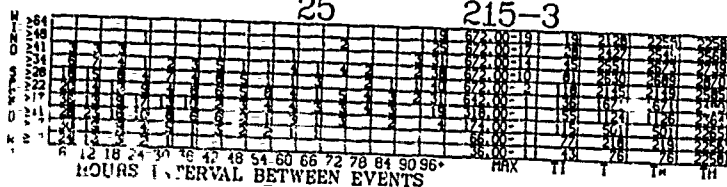
23

216-3



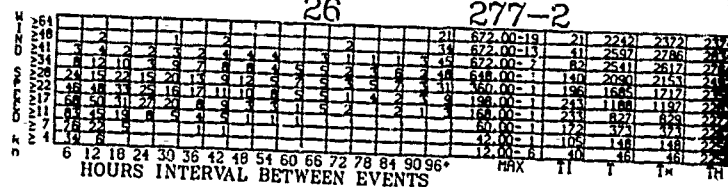
25

215-3



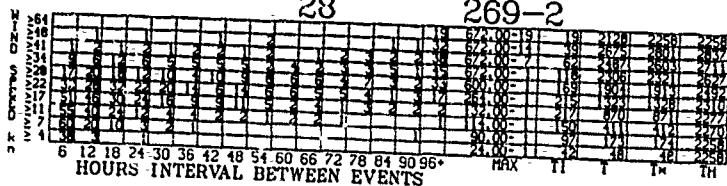
26

277-2



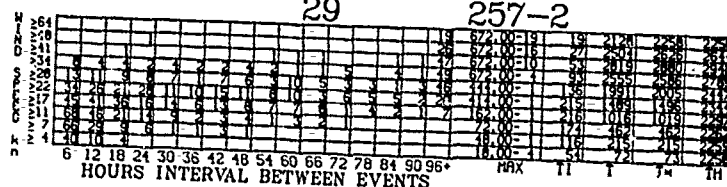
28

269-2



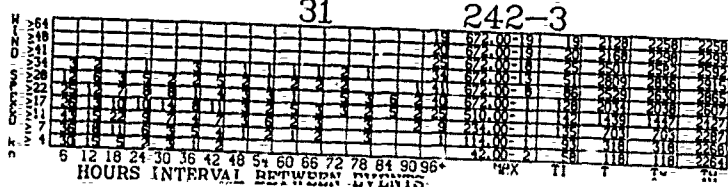
29

257-2



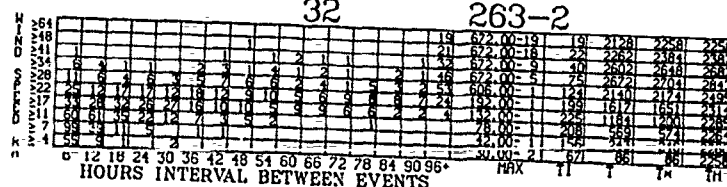
31

242-3



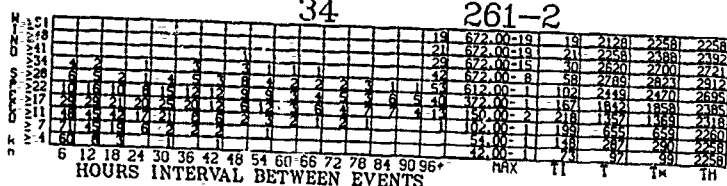
32

263-2



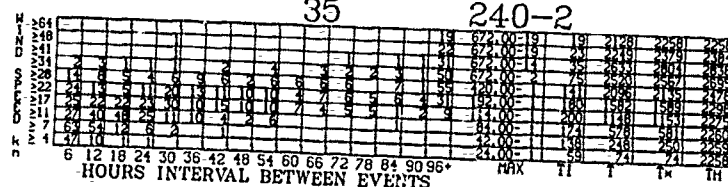
34

261-2



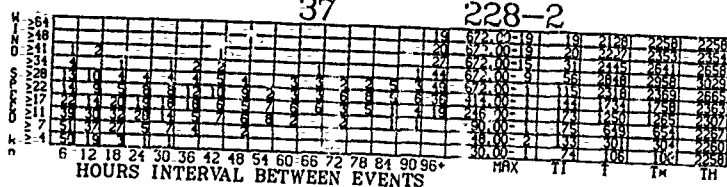
35

240-2



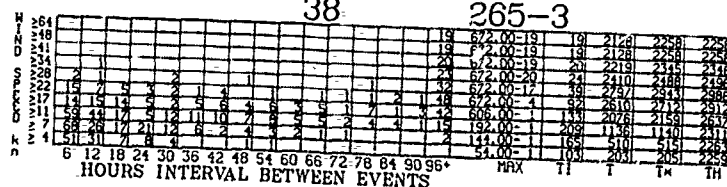
37

228-2



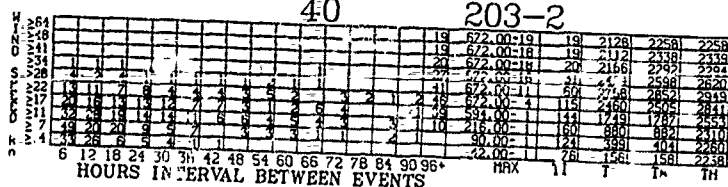
38

265-3



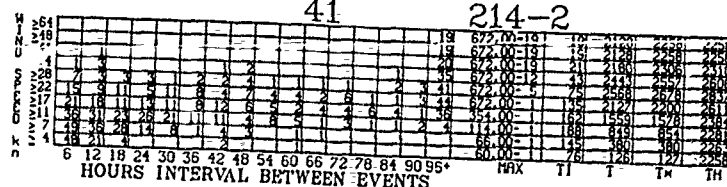
40

203-2

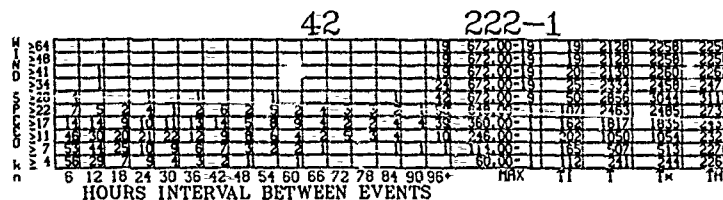
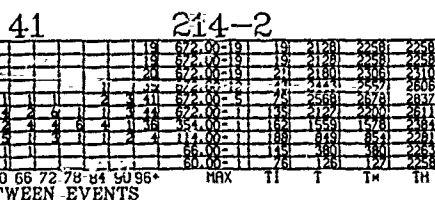
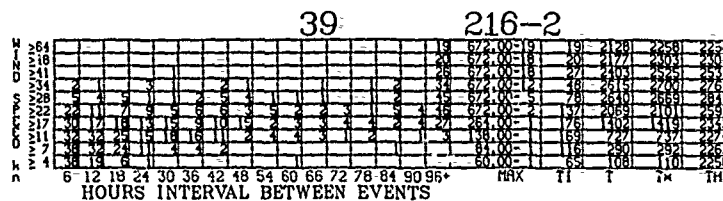
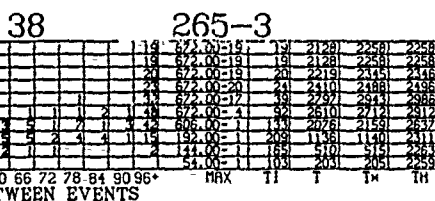
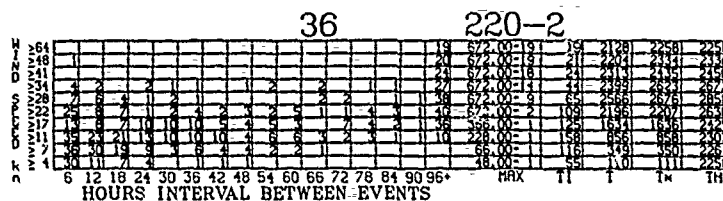
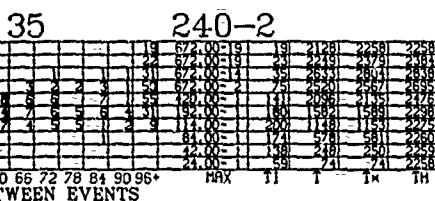
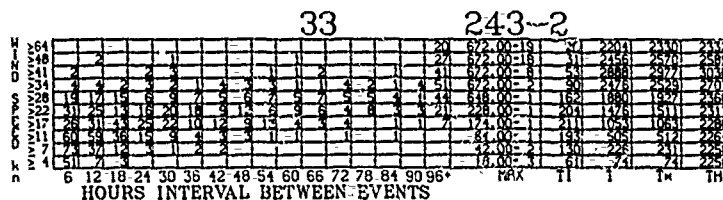
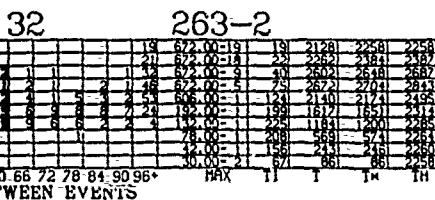
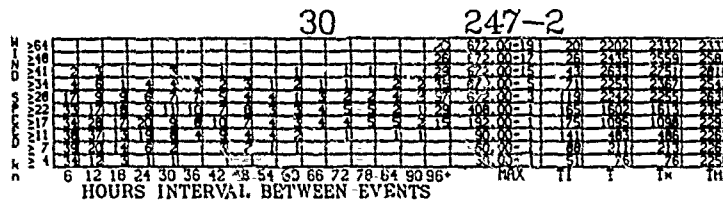
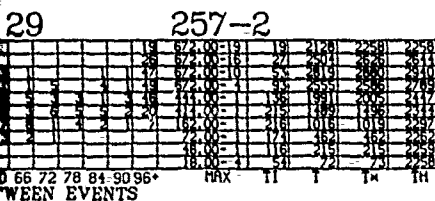
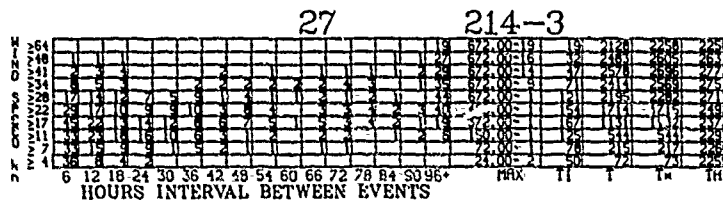
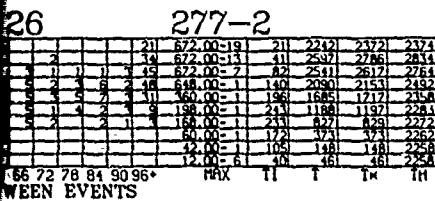
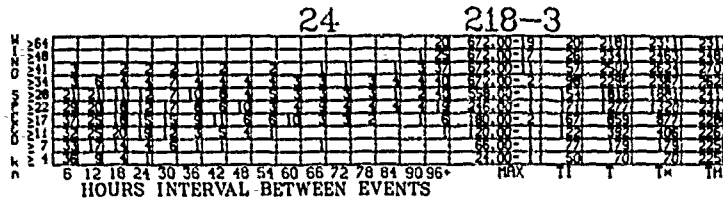
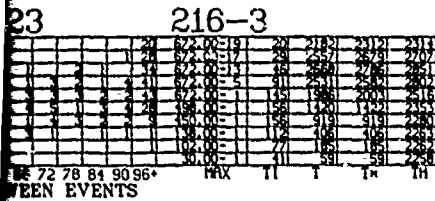


41

214-2

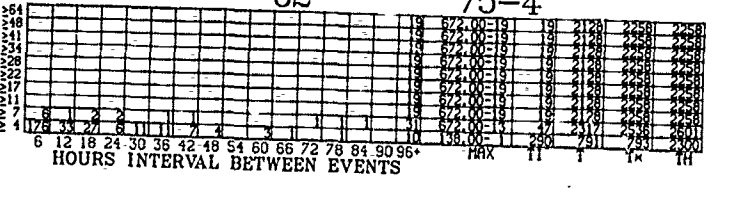
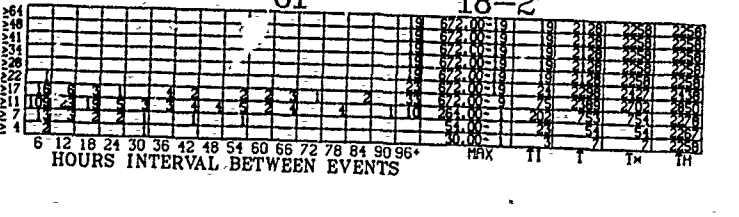
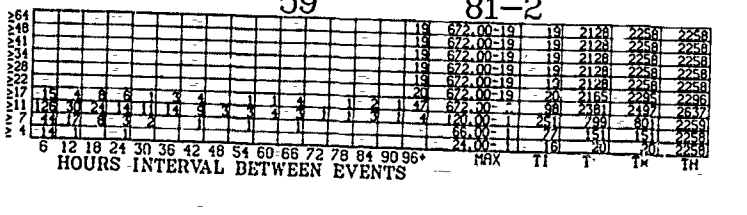
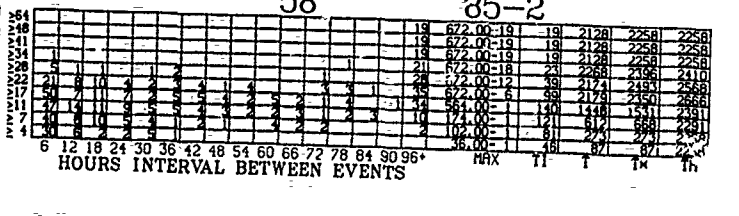
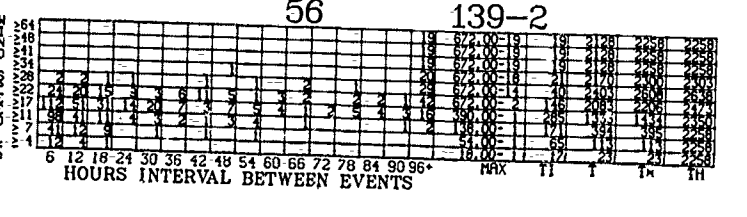
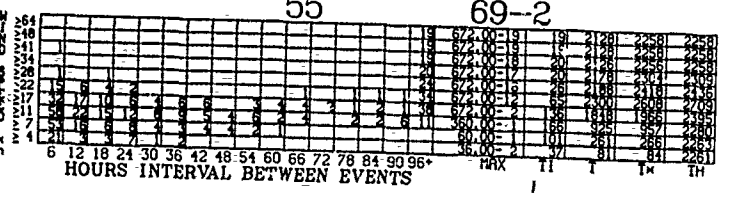
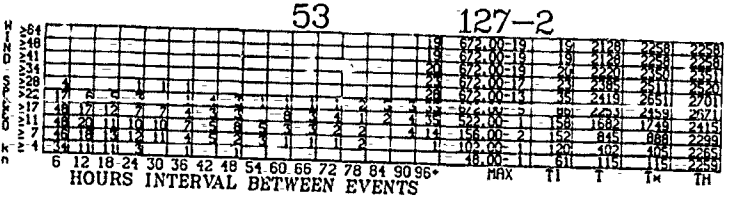
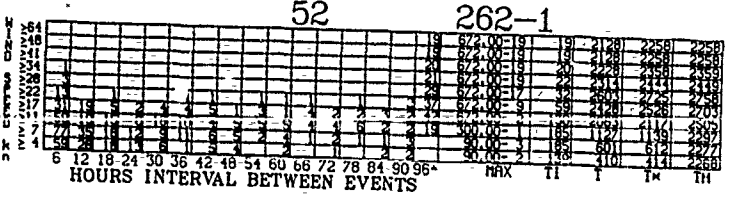
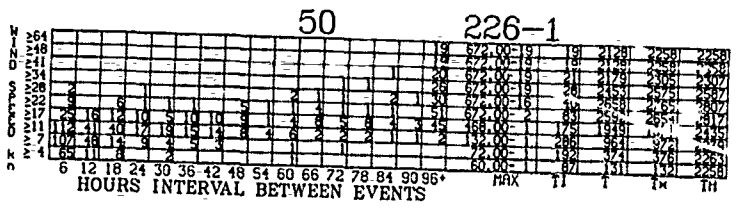
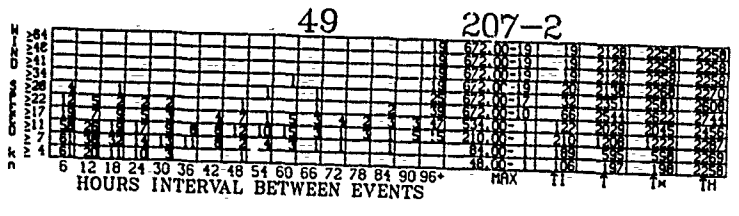
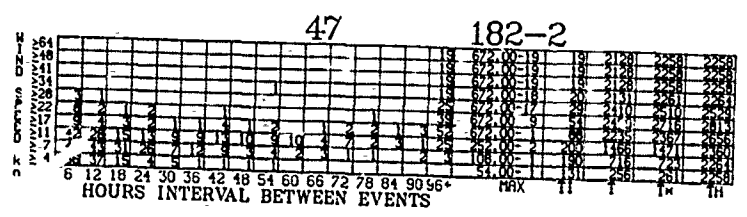
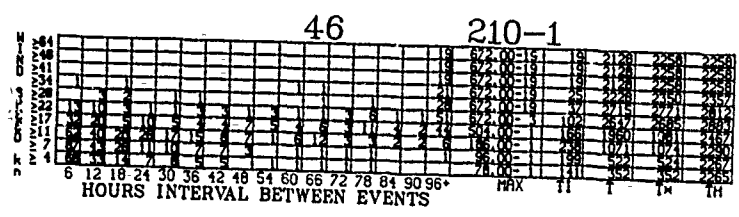
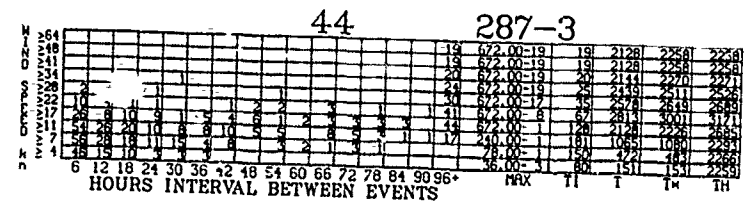
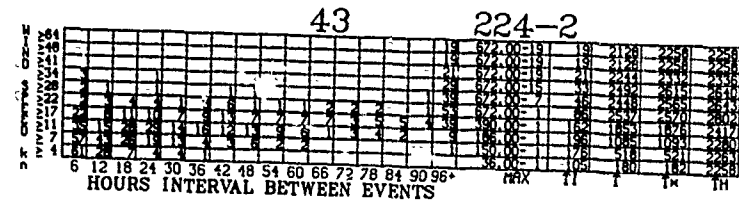


# WIND SPEED INTERVALS (Cont'd)





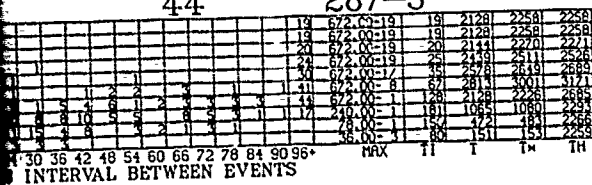
# WIND SPEED INTERVALS (Cont'd)



# FEBRUARY

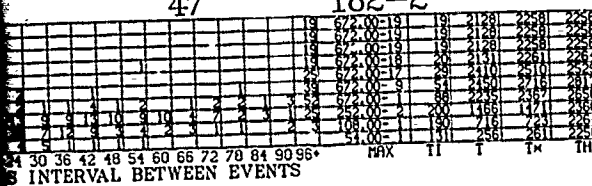
44

287-3



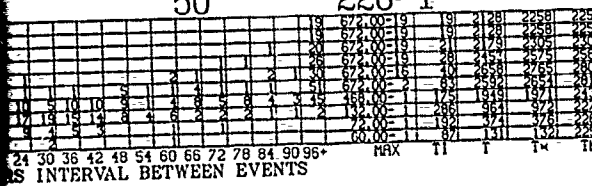
47

182-2



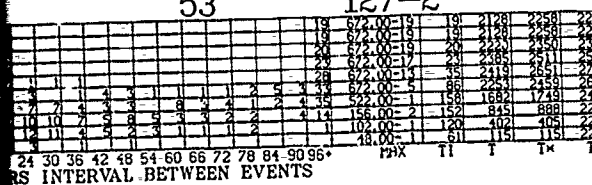
50

226-1



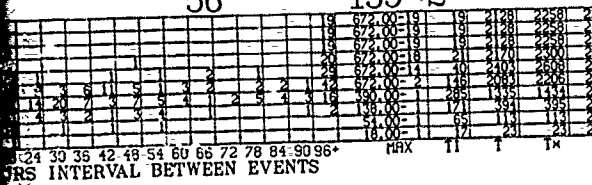
53

127-2



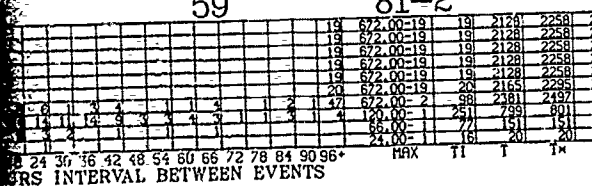
56

139-2



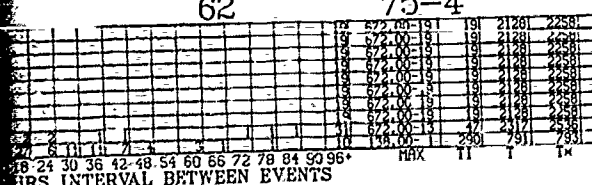
59

81-2



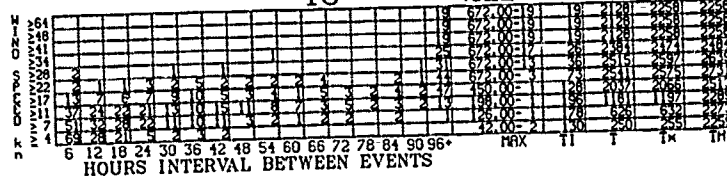
62

75-4



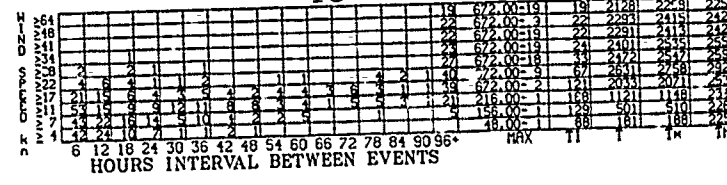
45

211-2



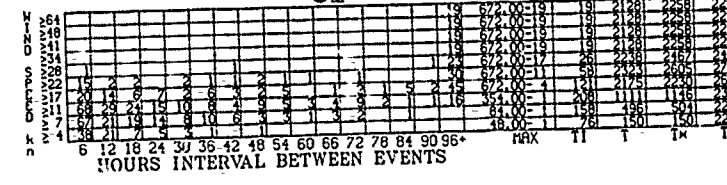
48

151-2



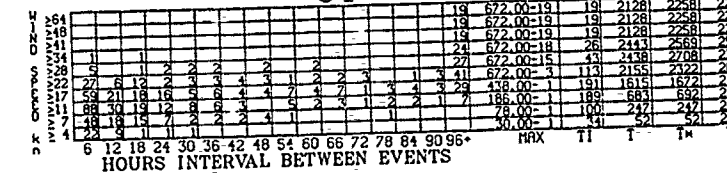
51

161-2



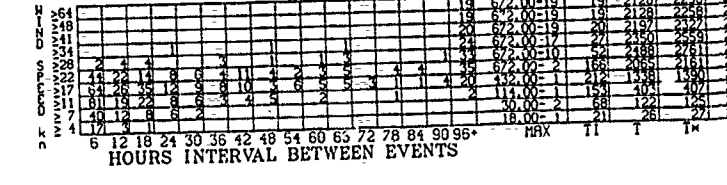
54

124-2



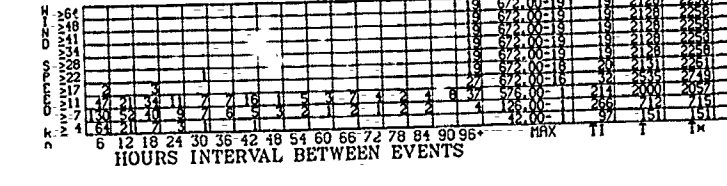
57

283-1



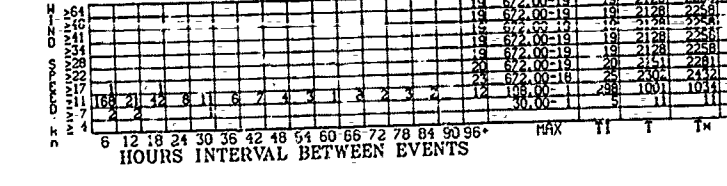
60

27-4



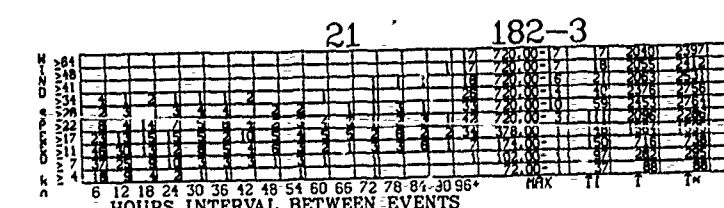
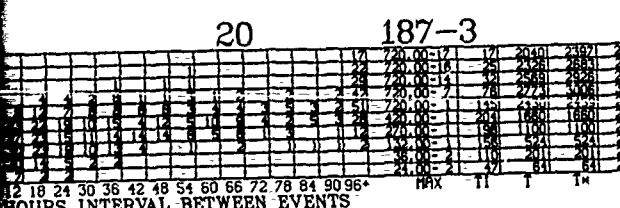
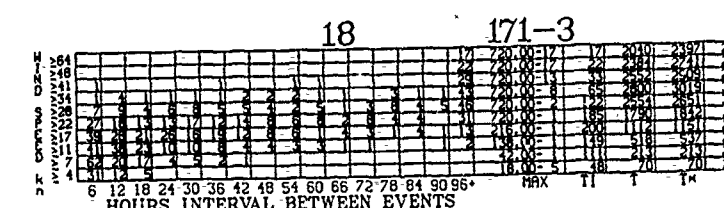
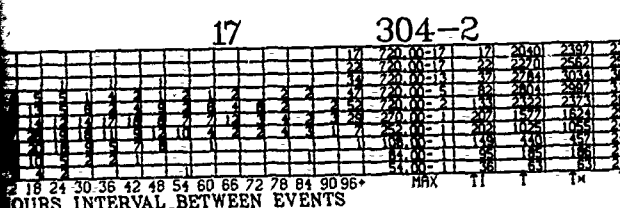
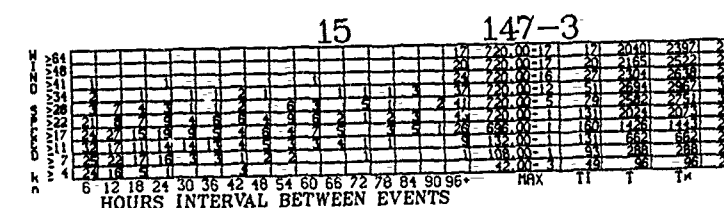
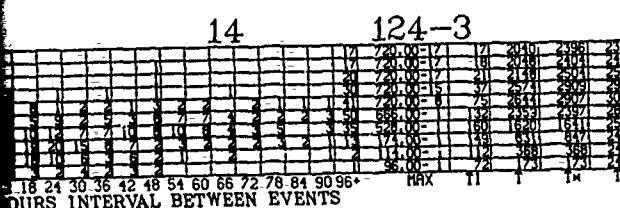
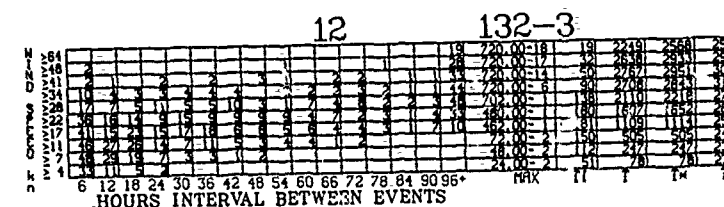
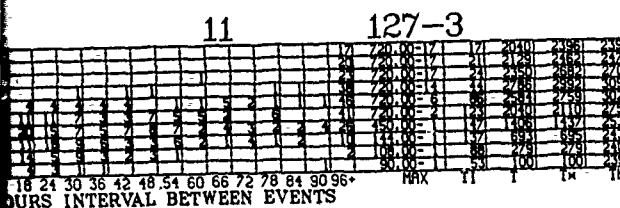
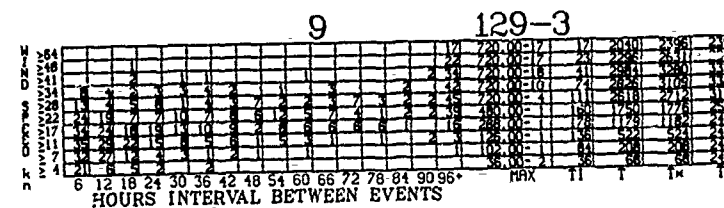
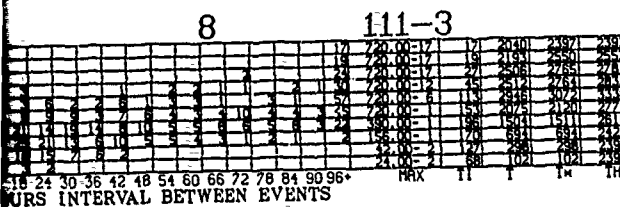
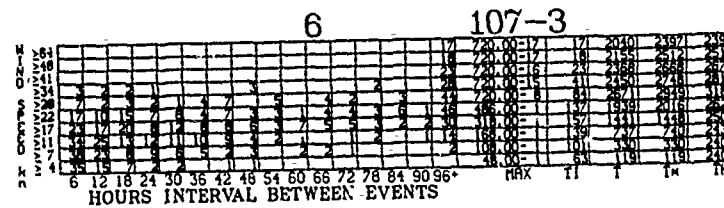
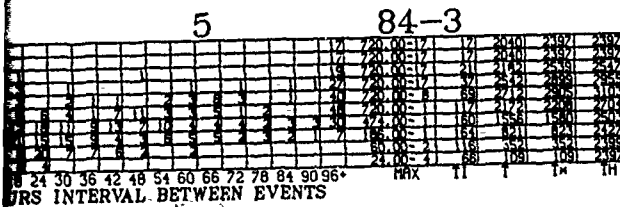
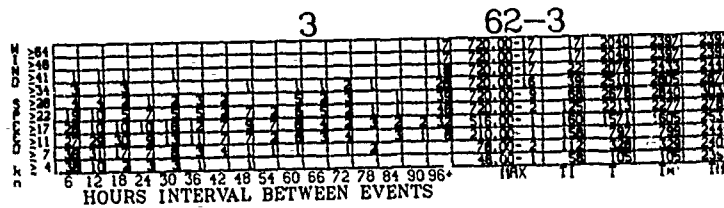
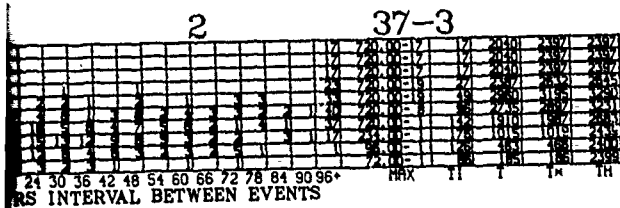
63

37-4





# WIND SPEED INTERVALS



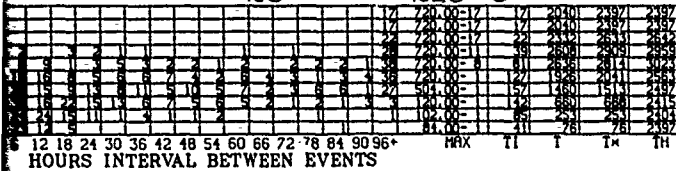




# APRIL

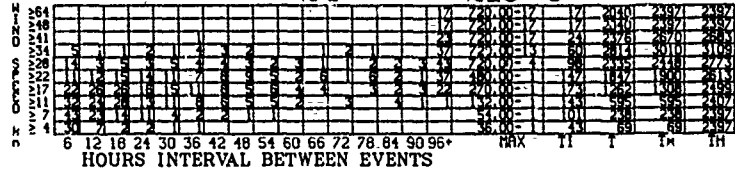
23

216-3



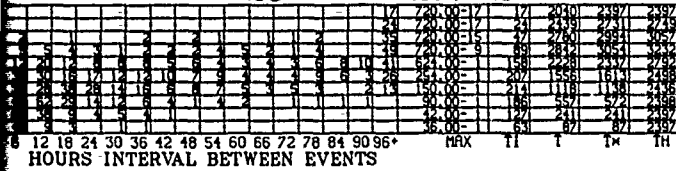
24

218-3



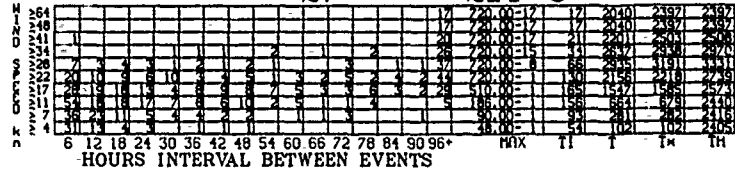
26

277-2



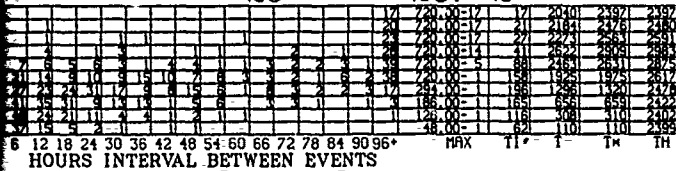
27

214-3



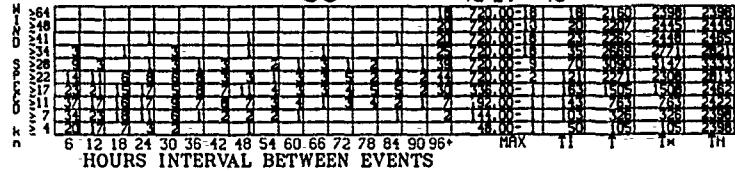
29

257-2



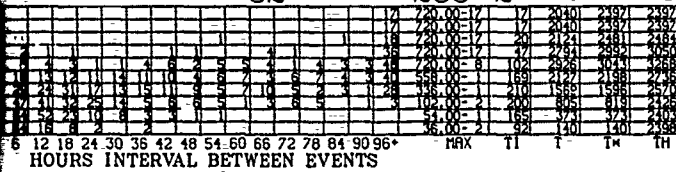
30

247-2



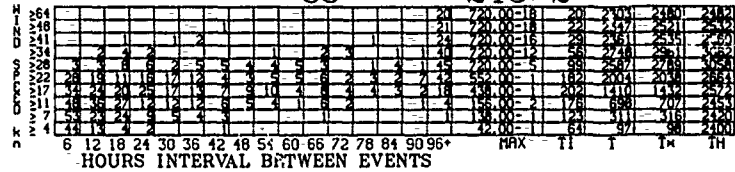
32

263-2



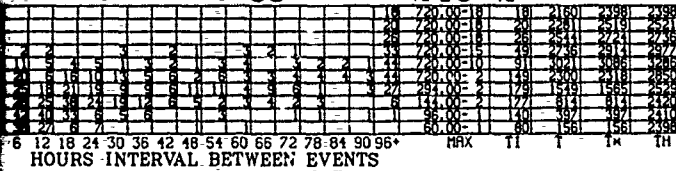
33

243-2



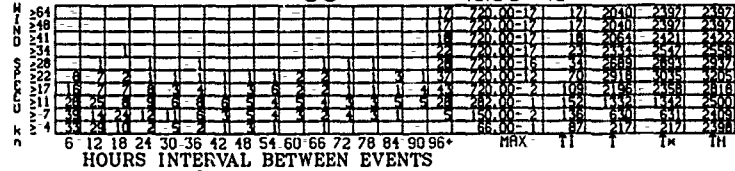
35

240-2



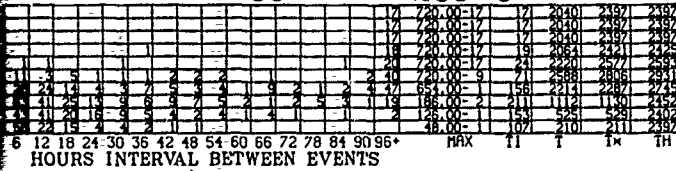
36

220-2



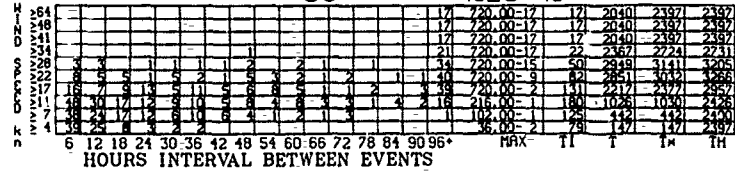
38

265-3



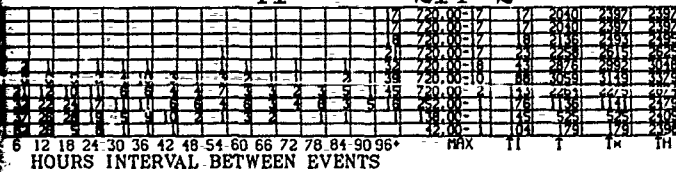
39

216-2



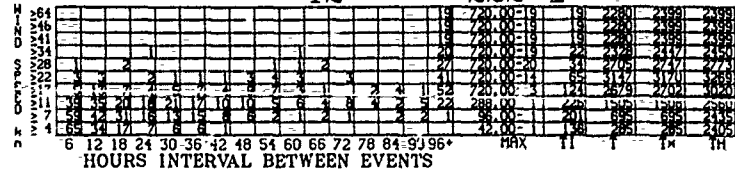
41

214-2



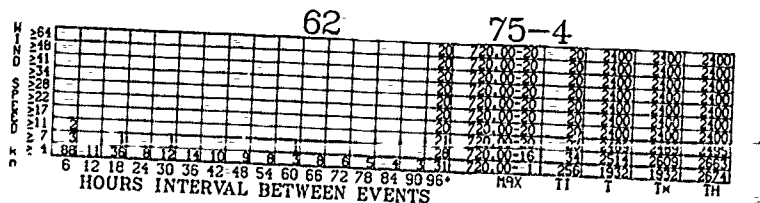
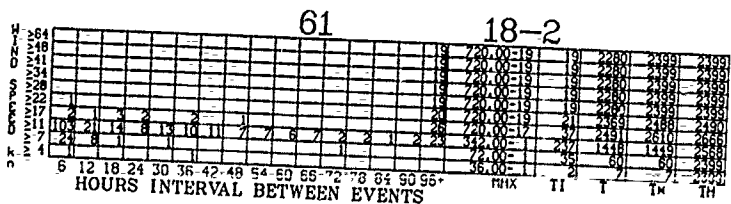
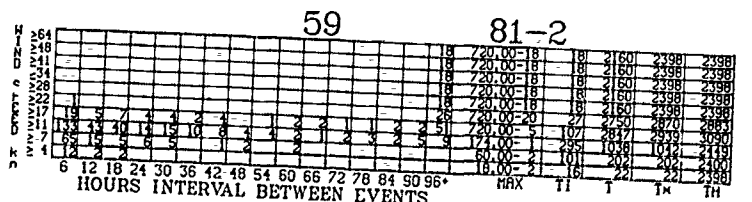
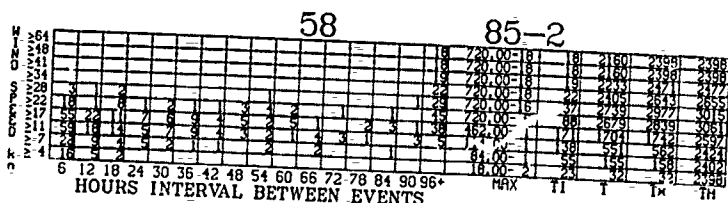
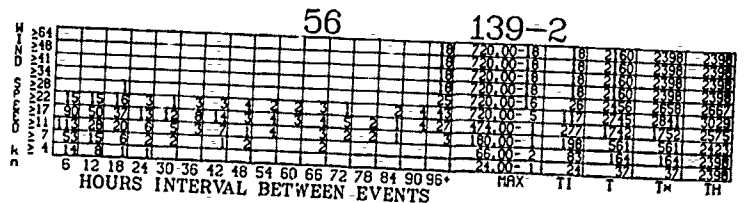
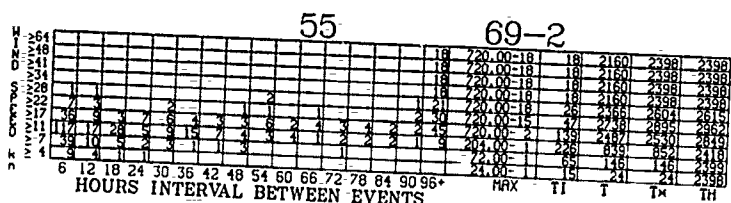
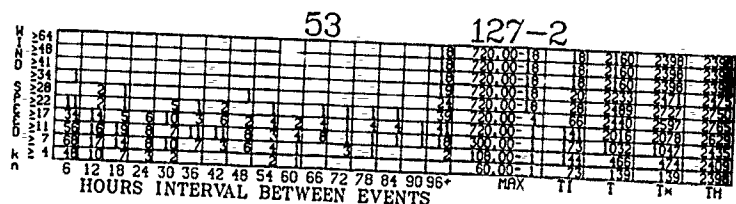
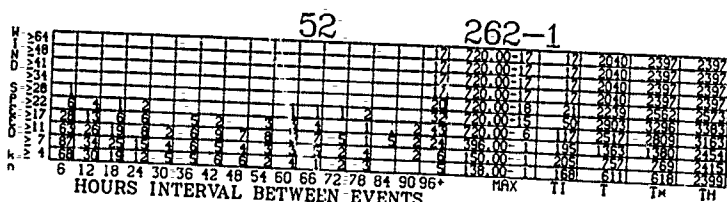
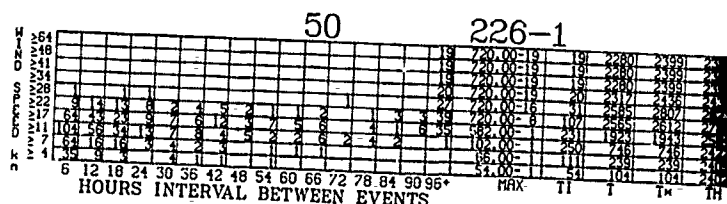
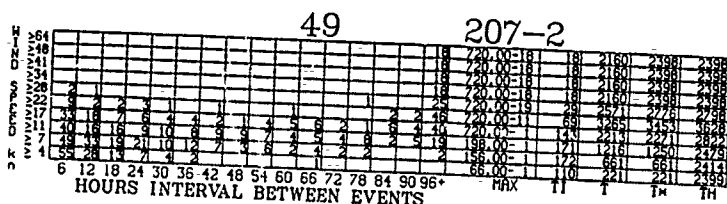
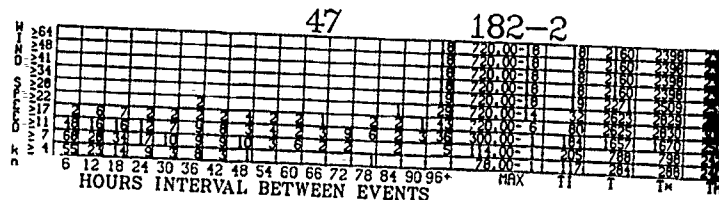
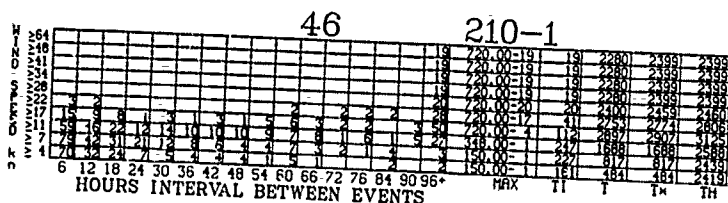
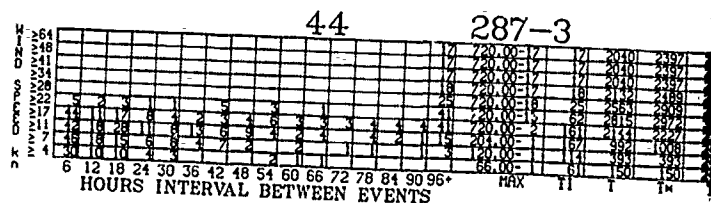
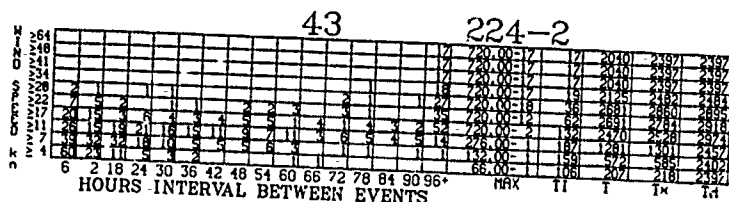
42

222-1



(2)

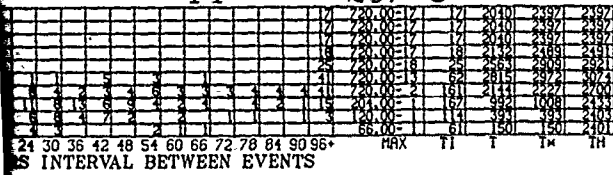
# APRIL



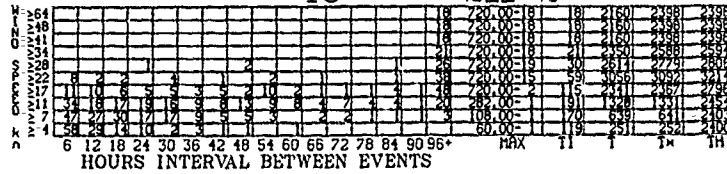


# WIND SPEED INTERVALS (Cont'd)

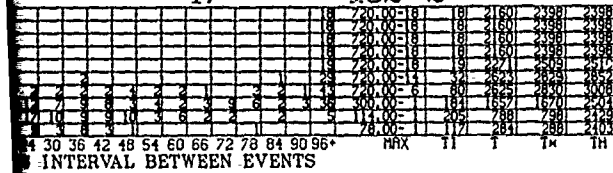
44 287-3



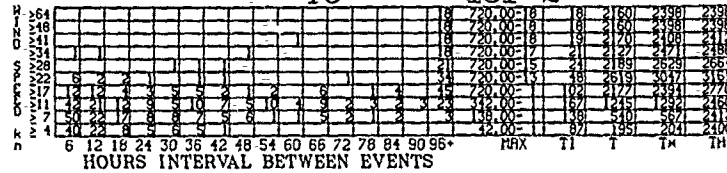
45 211-2



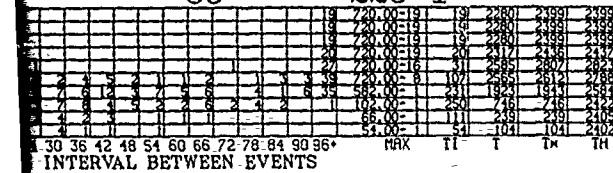
47 182-2



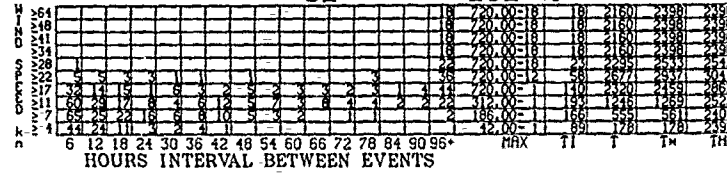
48 151-2



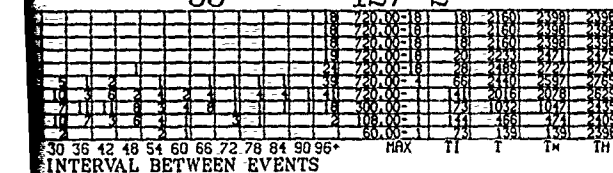
50 226-1



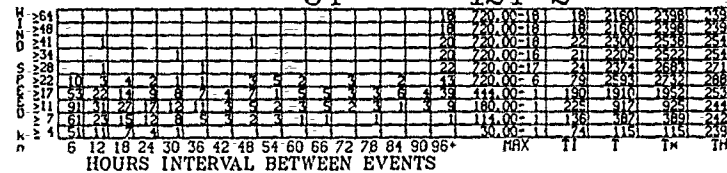
51 161-2



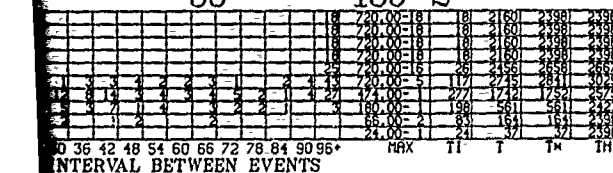
53 127-2



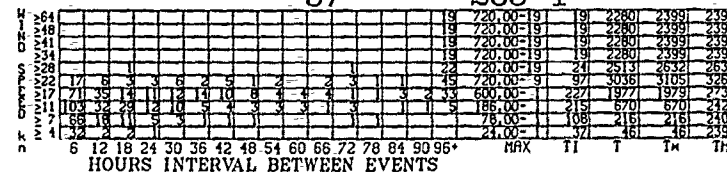
54 124-2



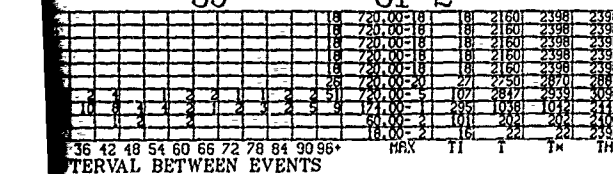
56 139-2



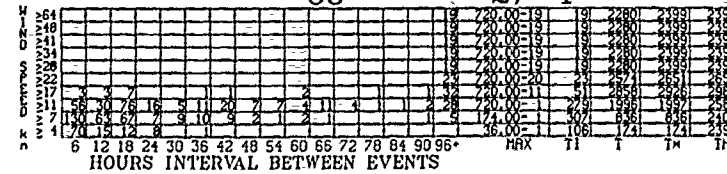
57 283-1



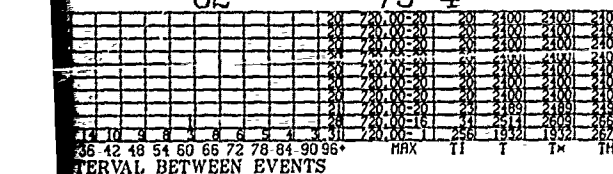
59 81-2



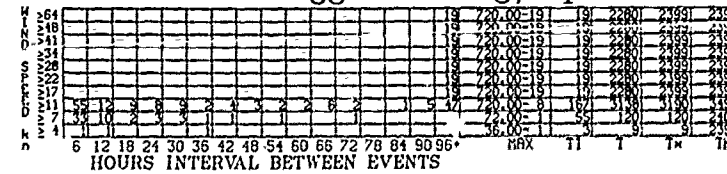
60 27-4



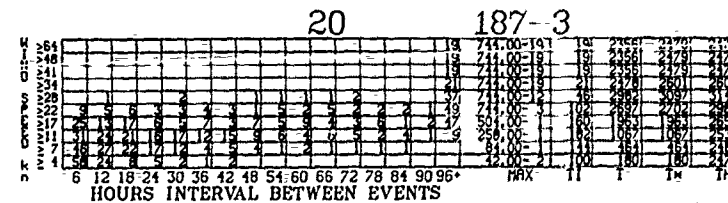
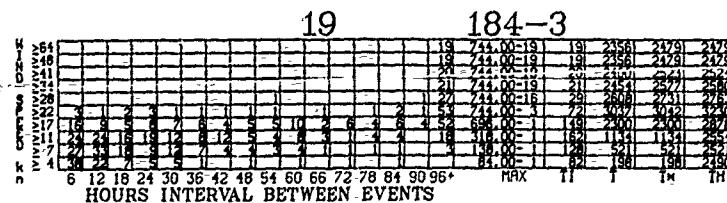
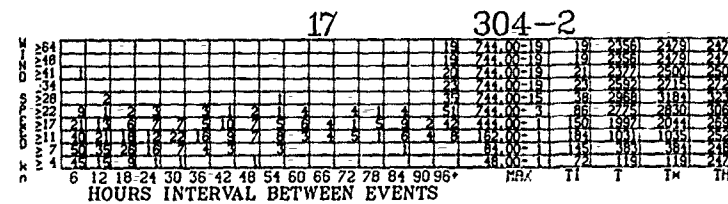
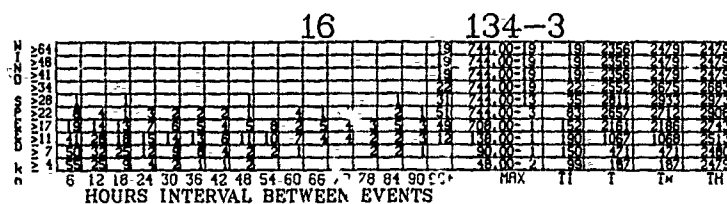
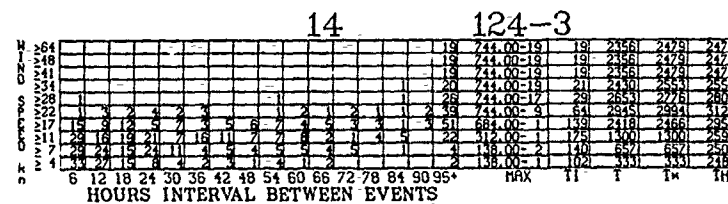
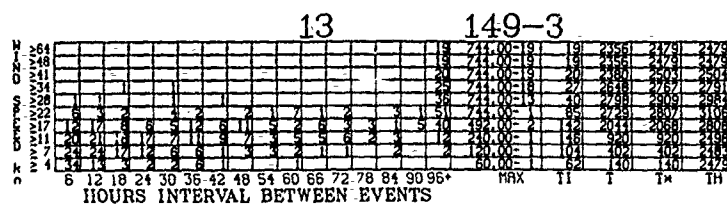
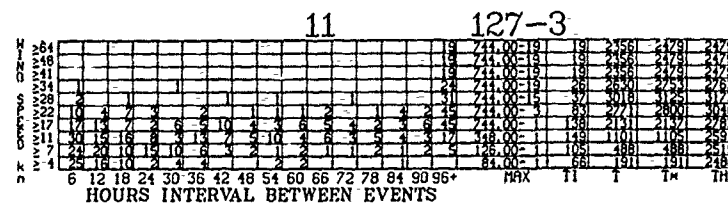
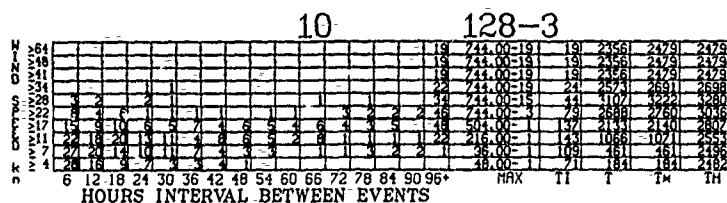
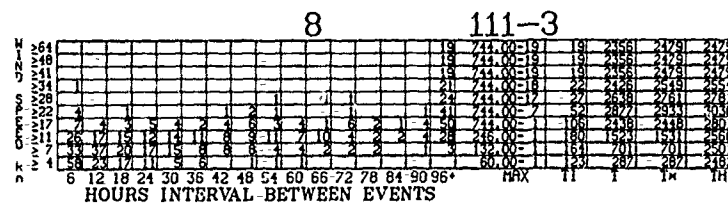
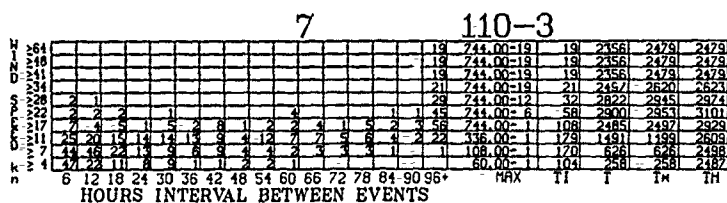
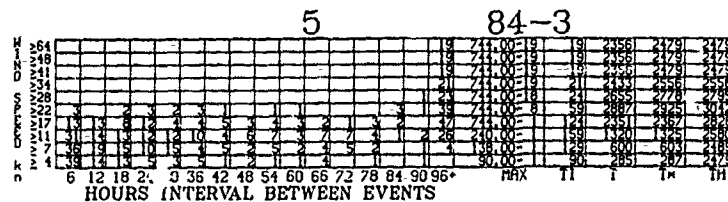
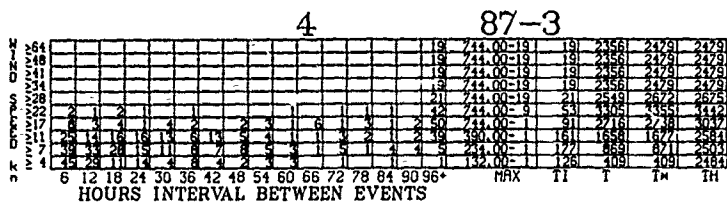
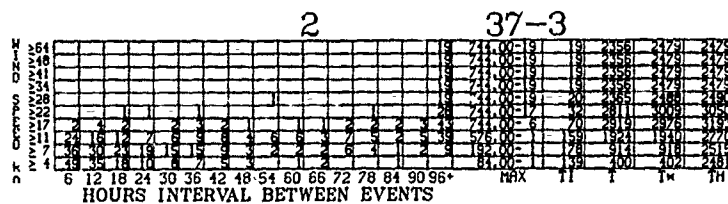
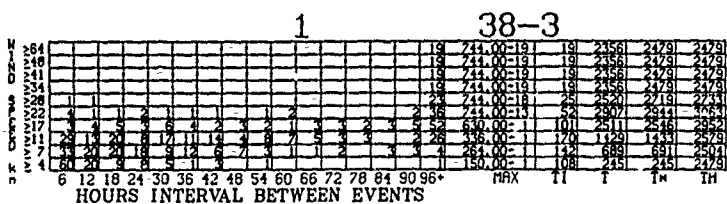
62 75-4



63 37-4



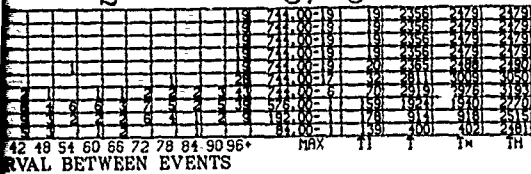
# WIND SPEED INTERVALS



JULY

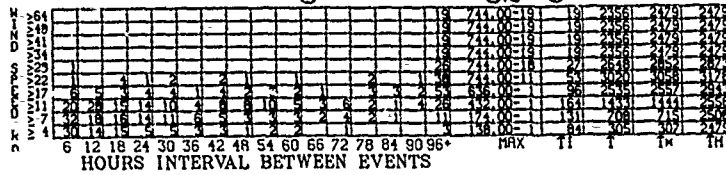
2

37-3



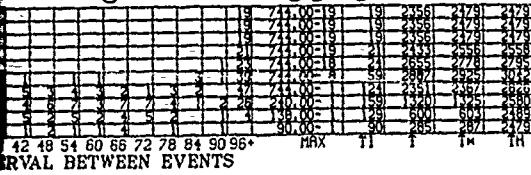
3

62-3



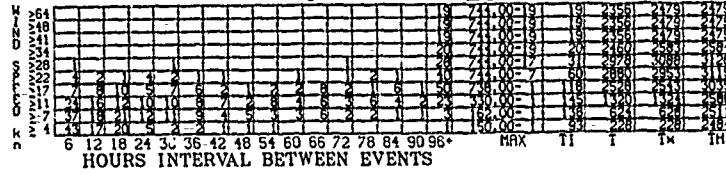
5

84-3



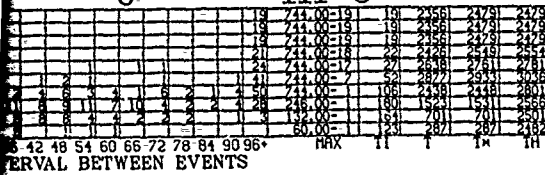
6

107-3



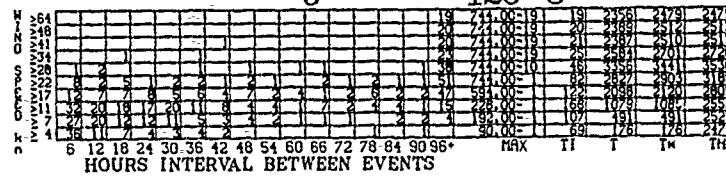
8

111-3



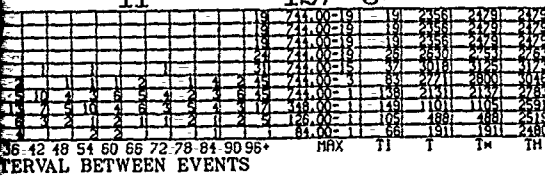
9

129-3



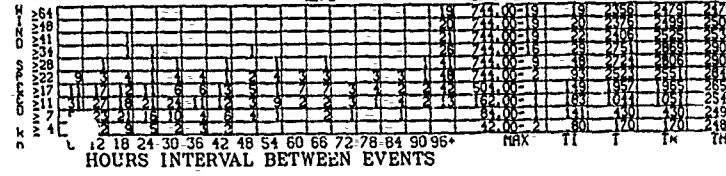
11

127-3



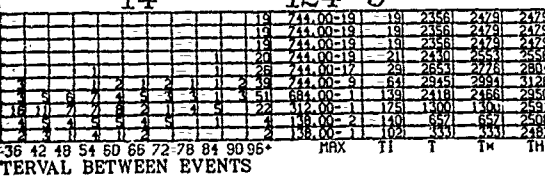
12

132-3



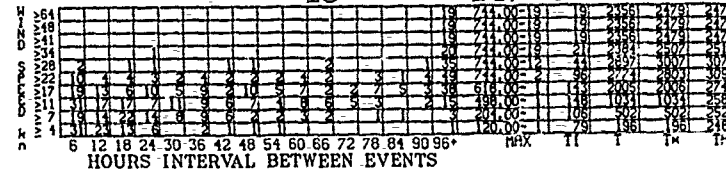
14

124-3



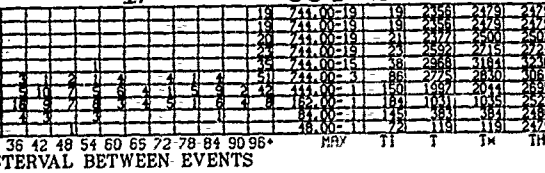
15

147-3



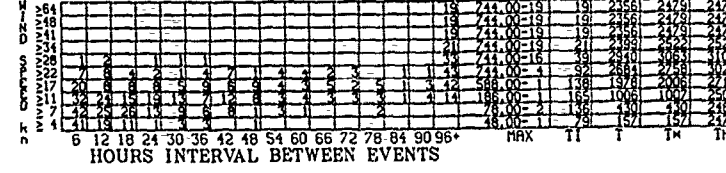
17

304-2



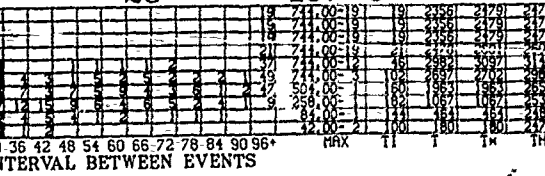
18

171-3



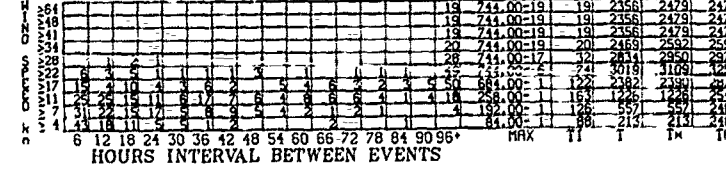
20

187-3



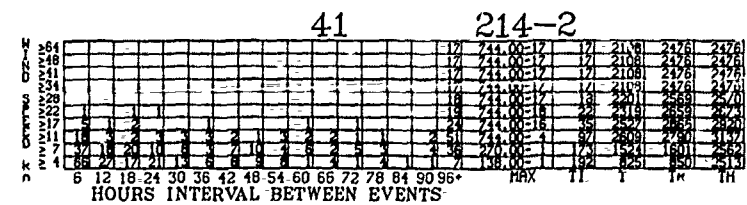
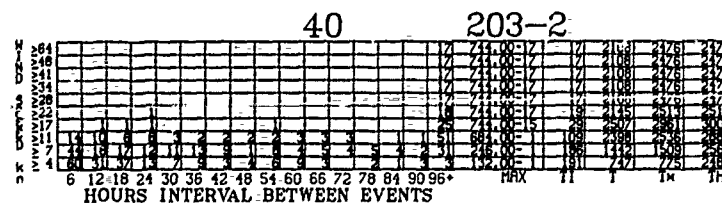
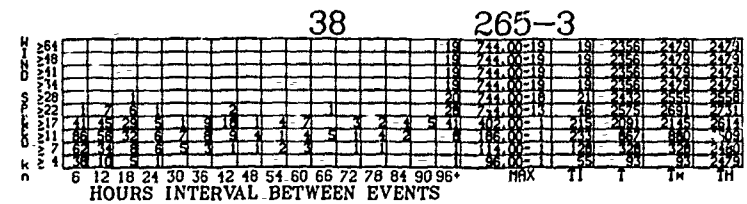
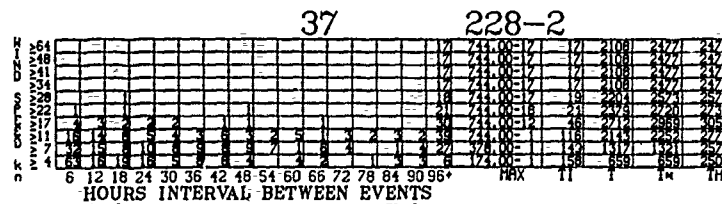
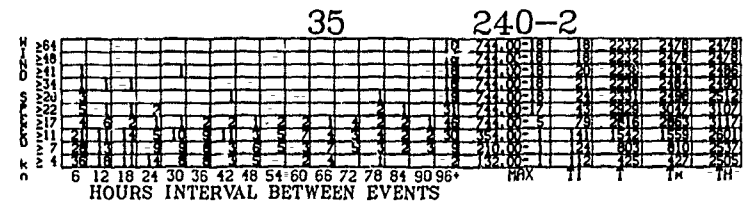
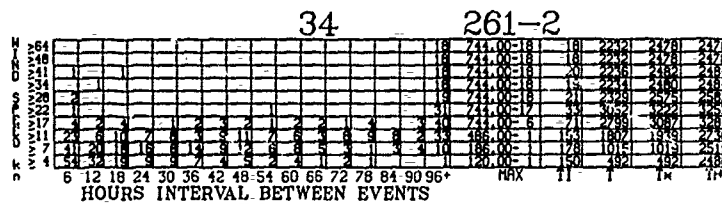
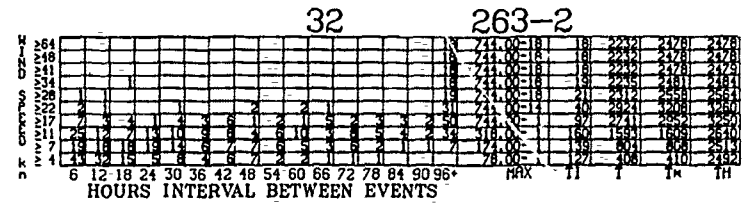
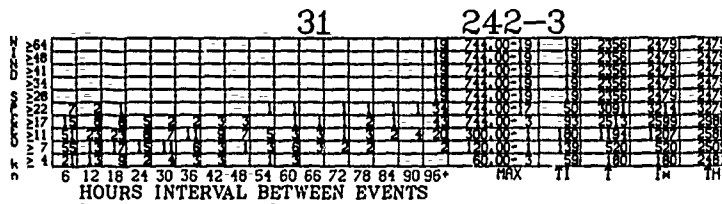
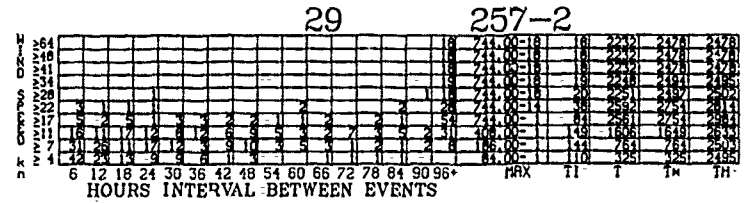
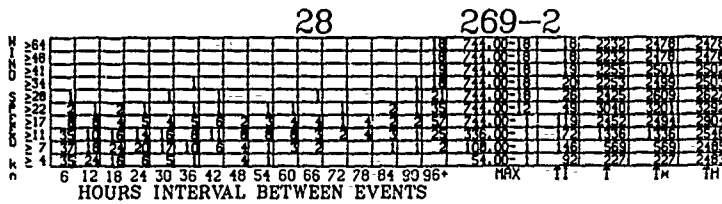
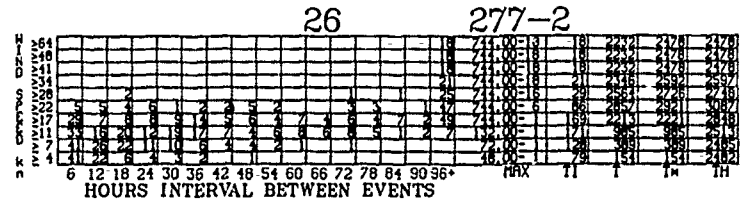
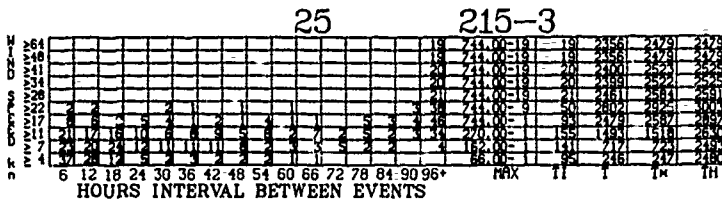
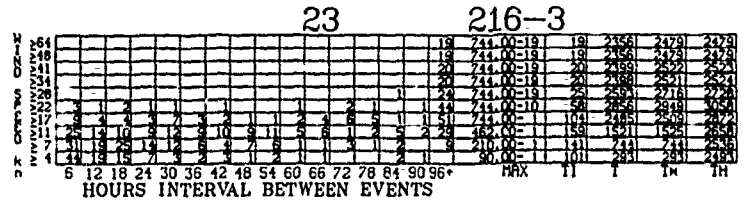
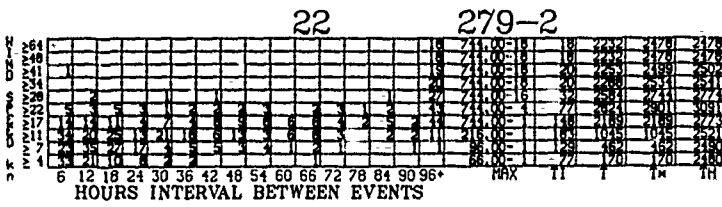
21

182-3



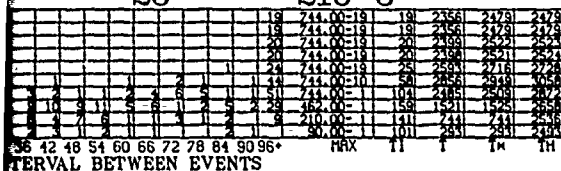
JULY

WI

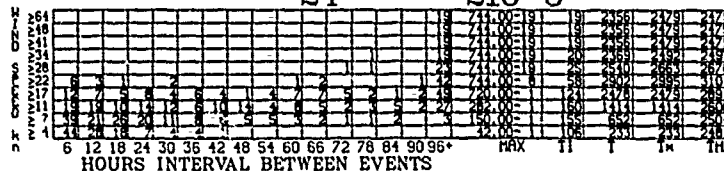


# WIND SPEED INTERVALS (Cont'd)

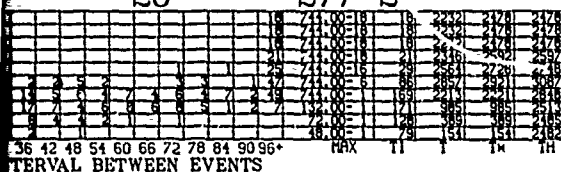
23 216-3



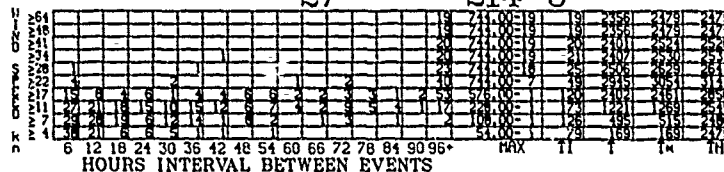
24 218-3



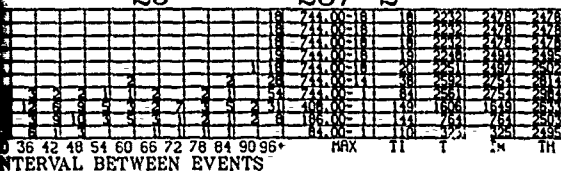
26 277-2



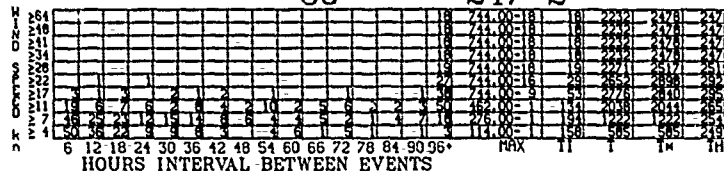
27 214-3



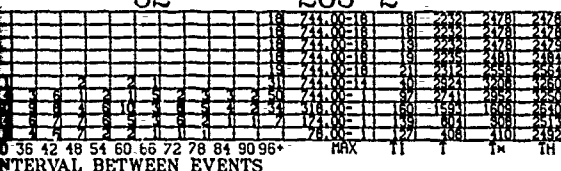
29 257-2



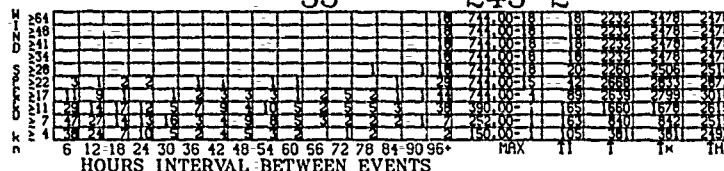
30 247-2



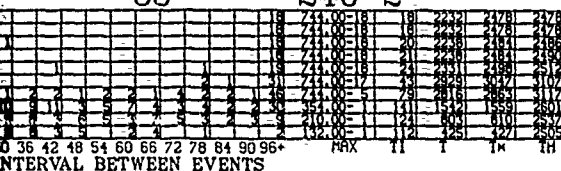
32 263-2



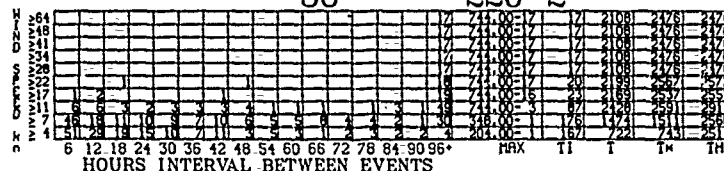
33 243-2



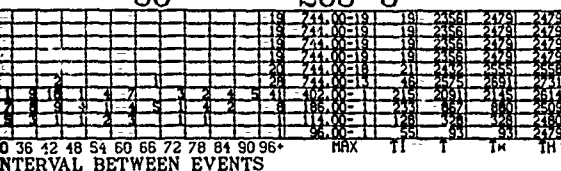
35 240-2



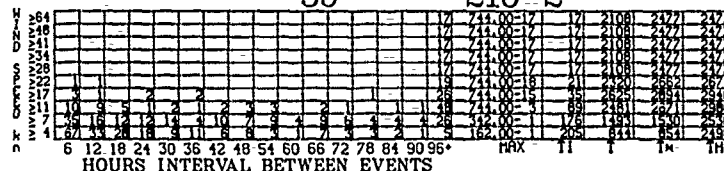
36 220-2



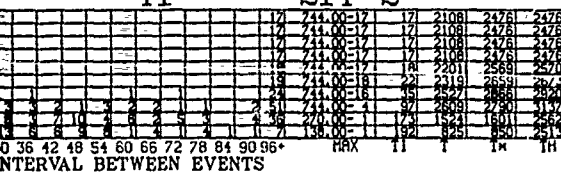
38 265-3



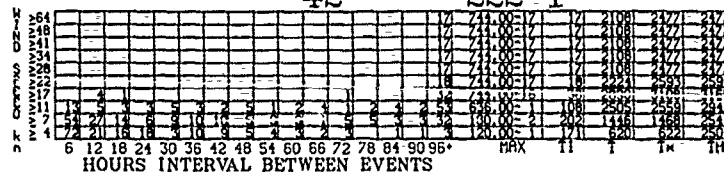
39 216-2



41 214-2

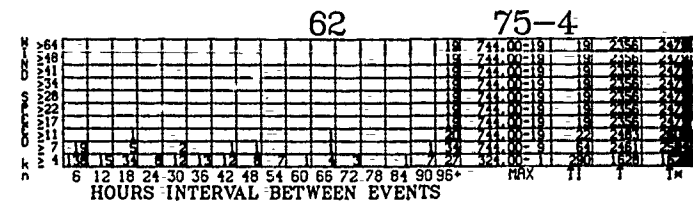
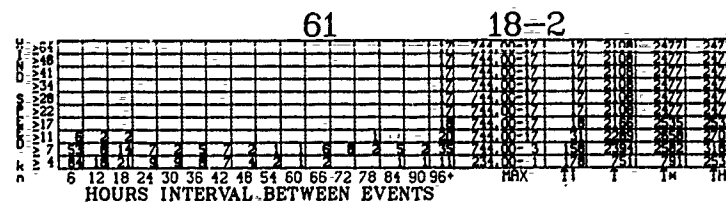
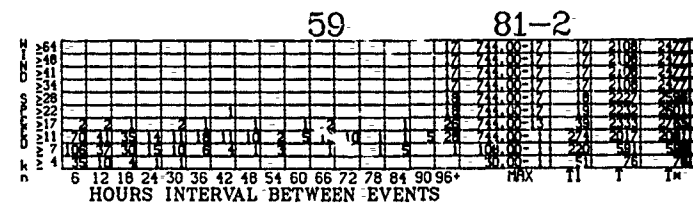
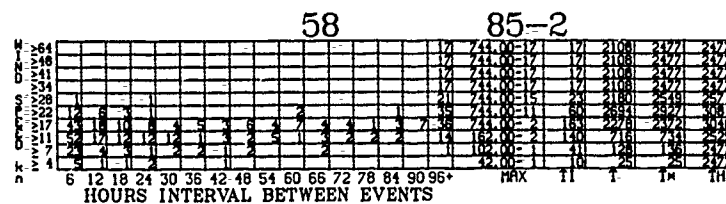
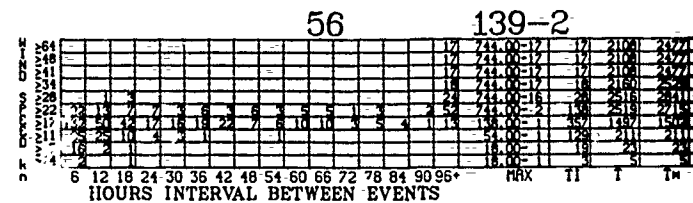
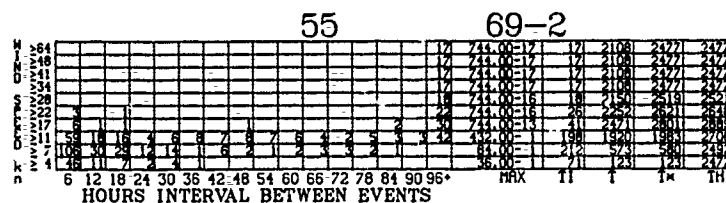
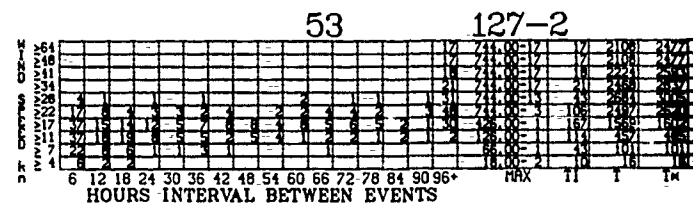
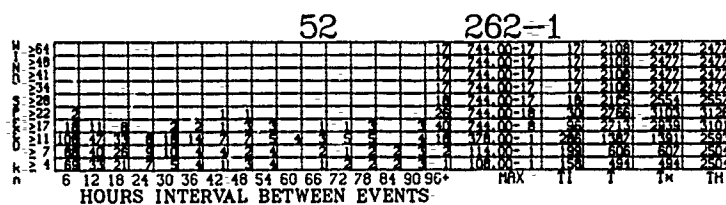
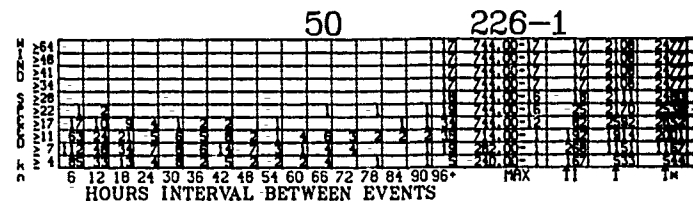
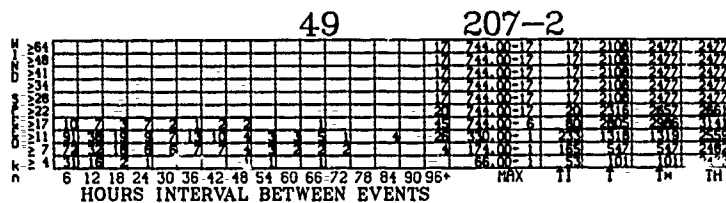
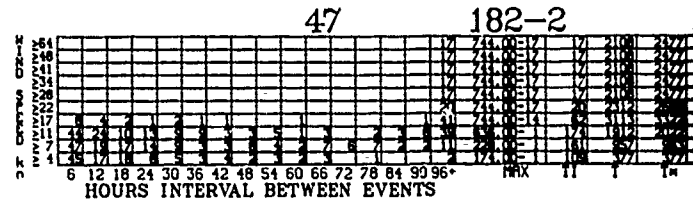
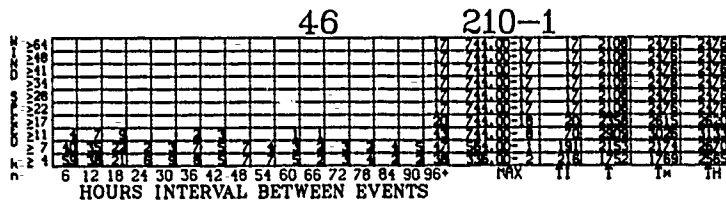
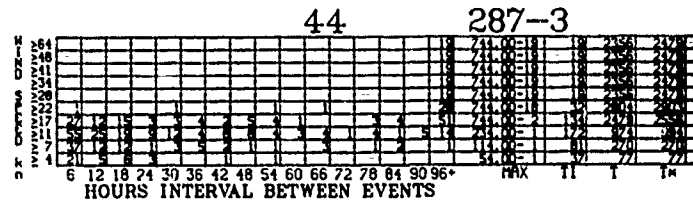
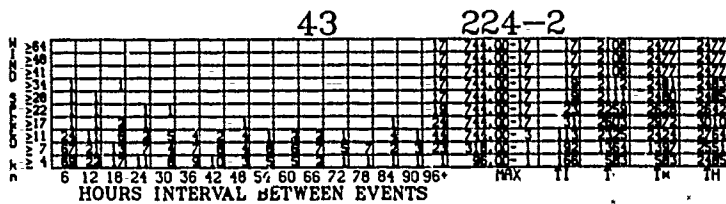


42 222-1





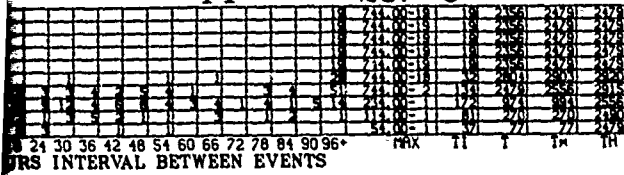
# WIND SPEED INTERVALS (Cont'd)



JULY

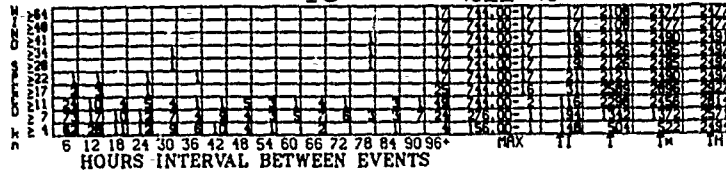
44

287-3



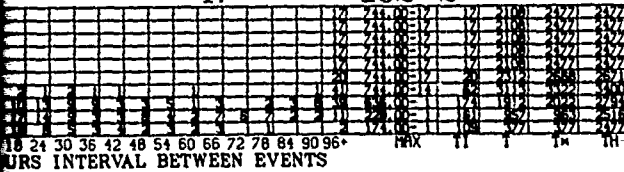
45

211-2



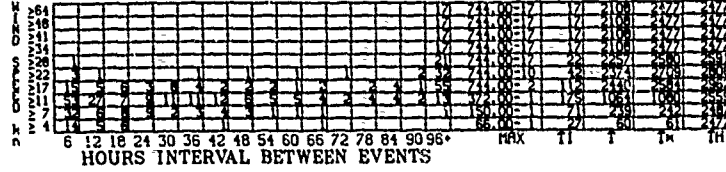
47

182-2



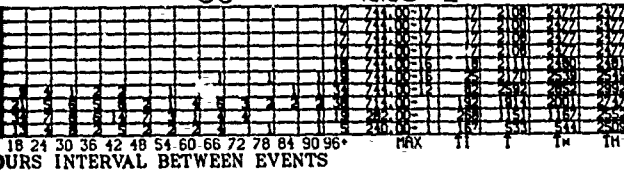
48

151-2



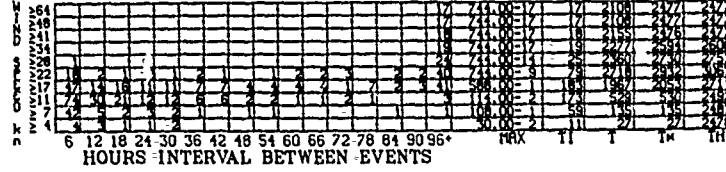
50

226-1



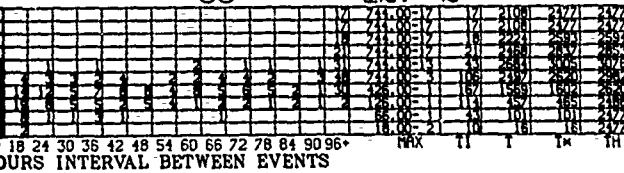
51

161-2



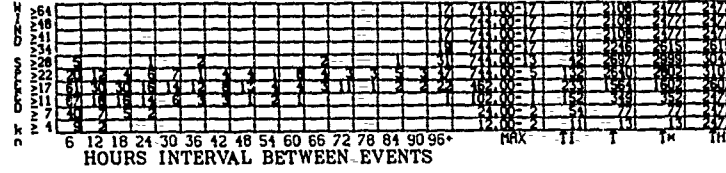
53

127-2



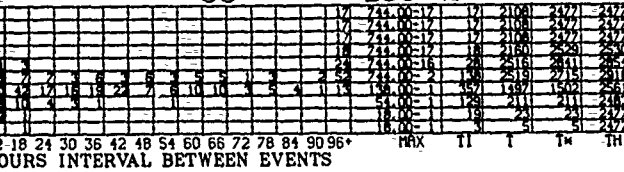
54

124-2



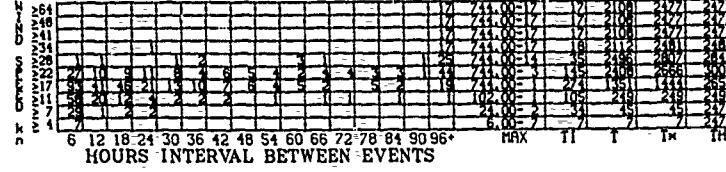
56

139-2



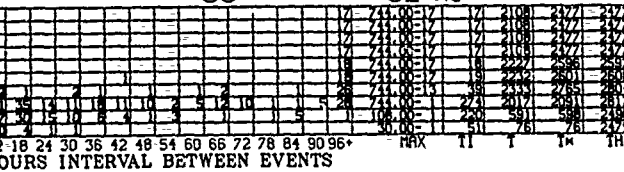
57

283-1



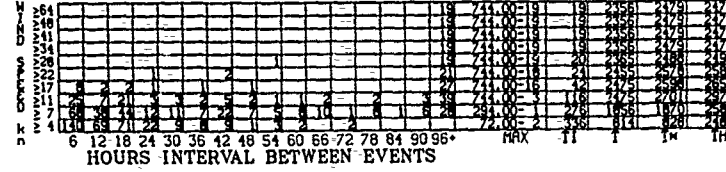
59

81-2



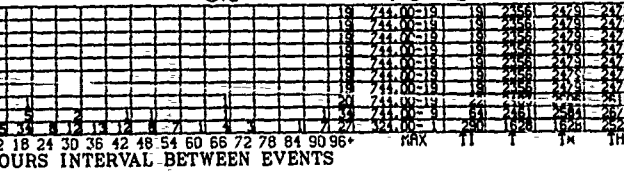
60

27-4



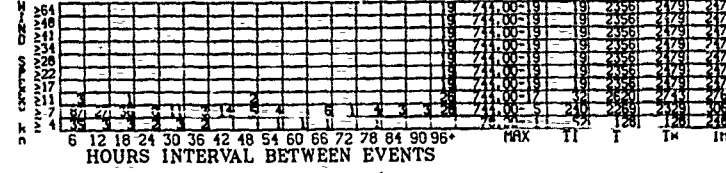
62

75-4



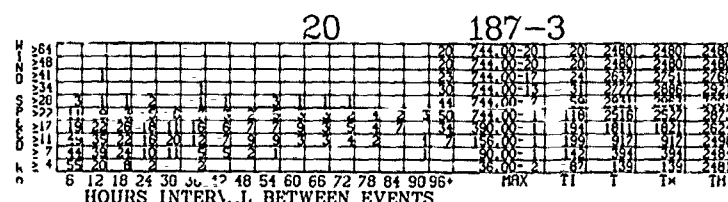
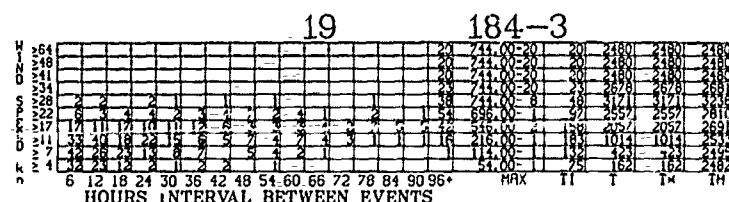
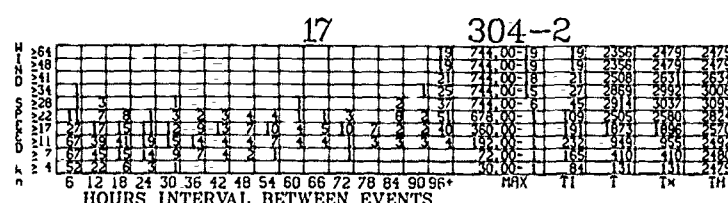
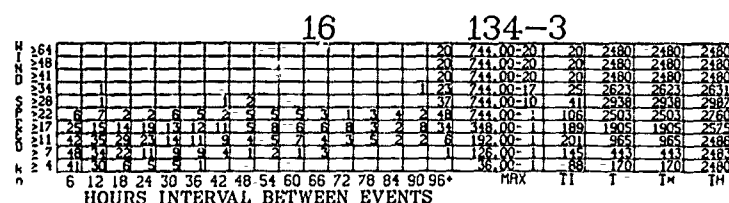
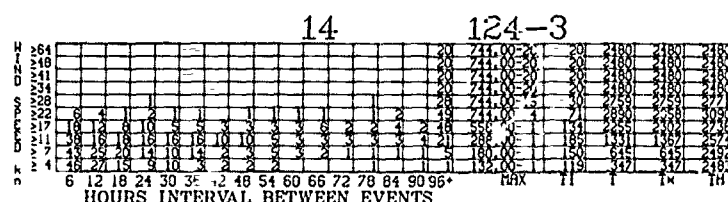
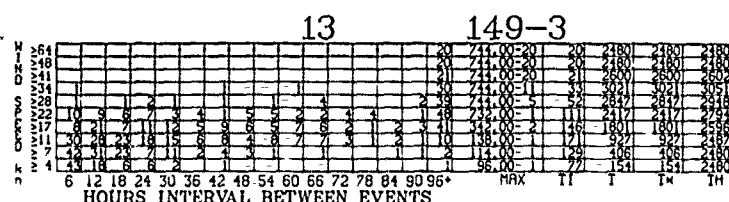
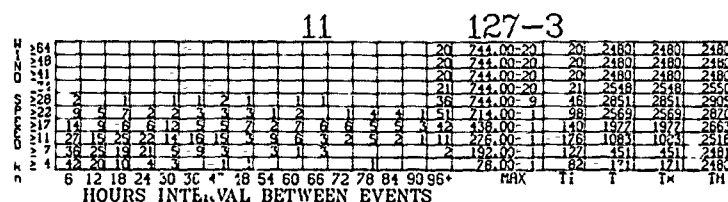
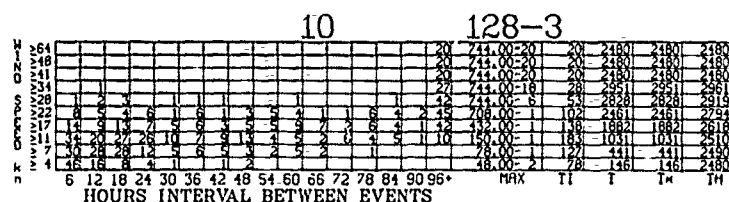
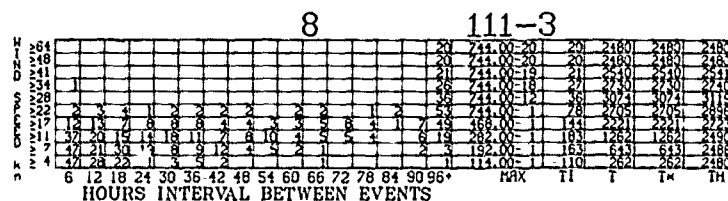
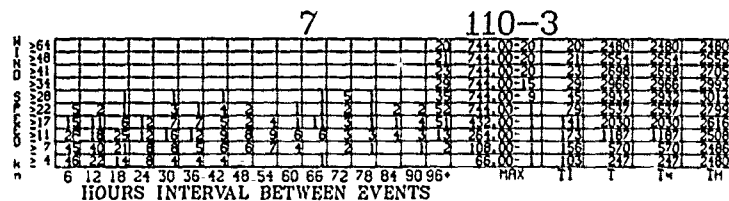
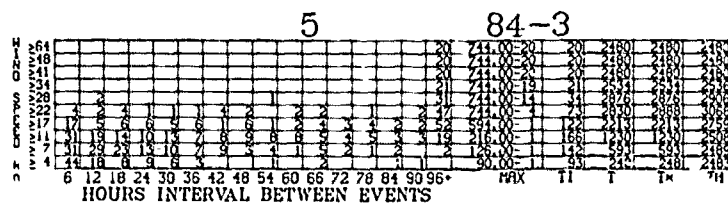
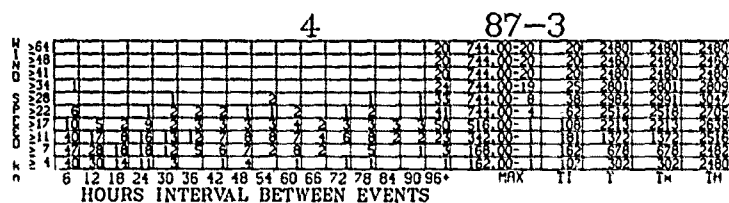
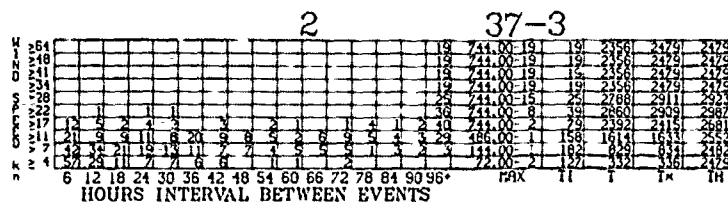
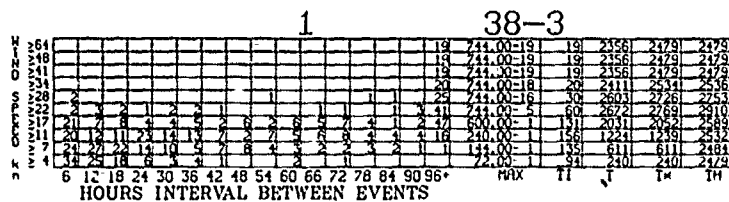
63

37-4



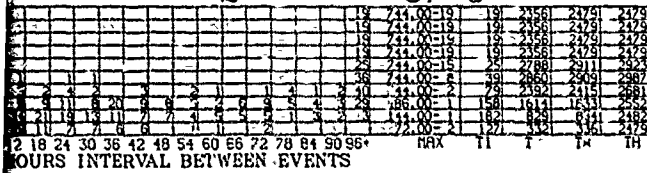


# AUGUST

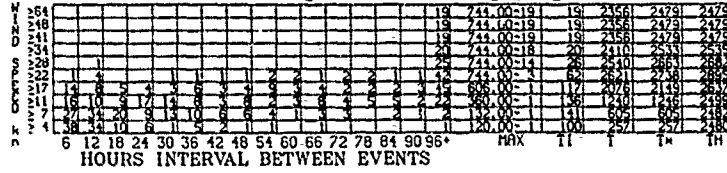


# WIND SPEED INTERVALS

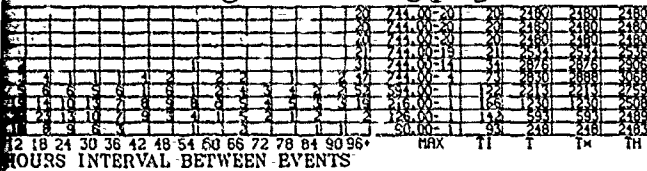
2 37-3



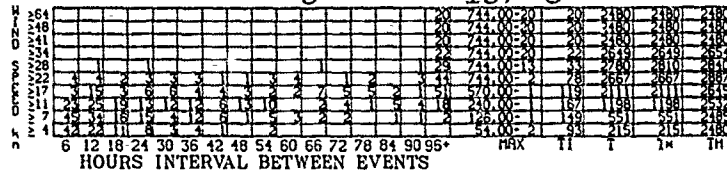
3 62-3



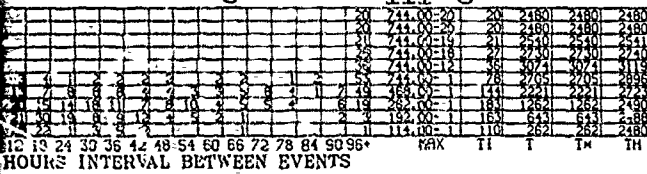
5 84-3



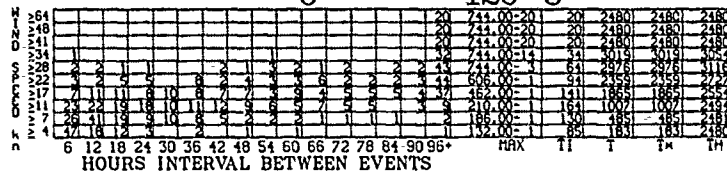
6 107-3



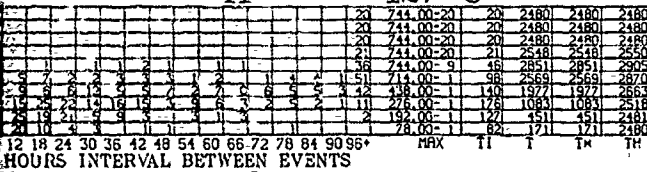
8 111-3



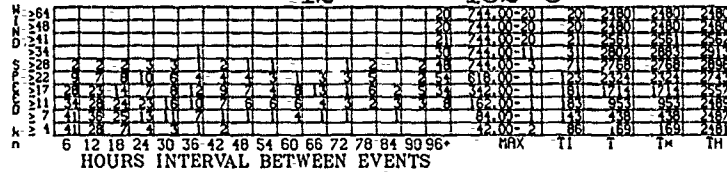
9 129-3



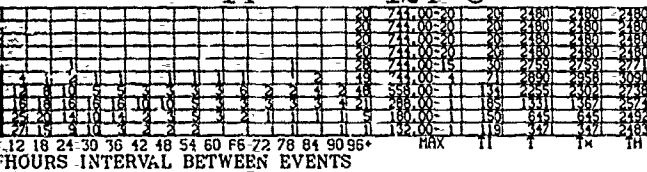
11 127-3



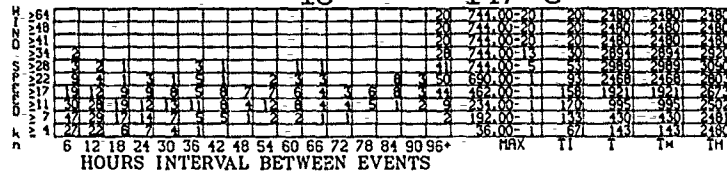
12 132-3



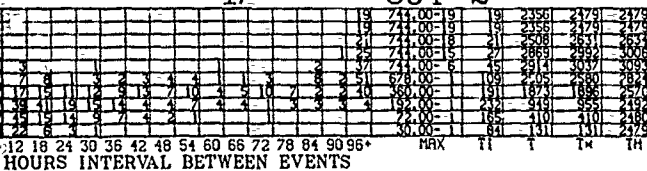
14 124-3



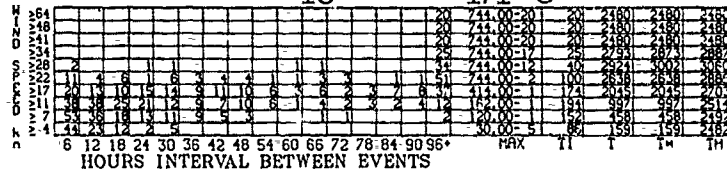
15 147-3



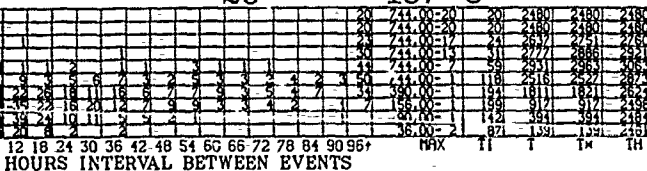
17 304-2



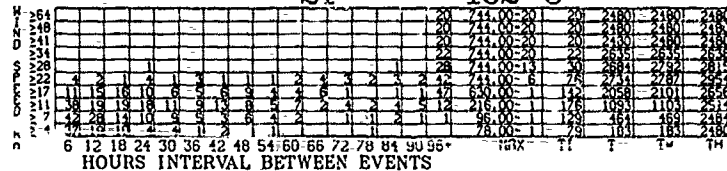
18 171-3



20 187-3

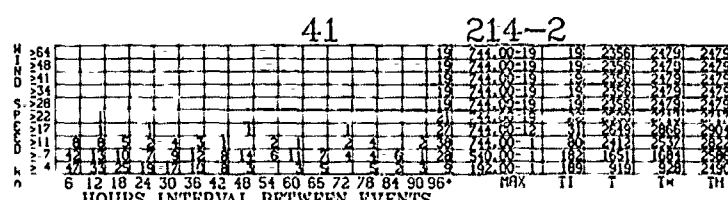
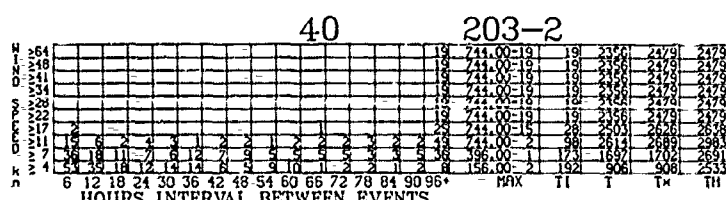
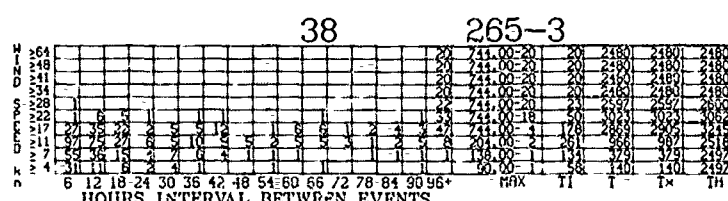
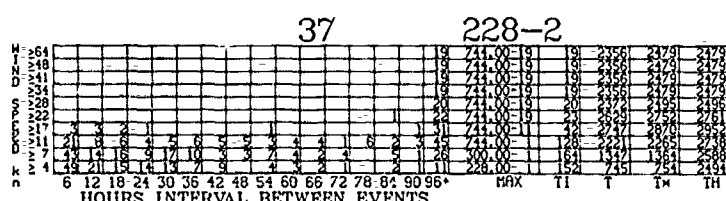
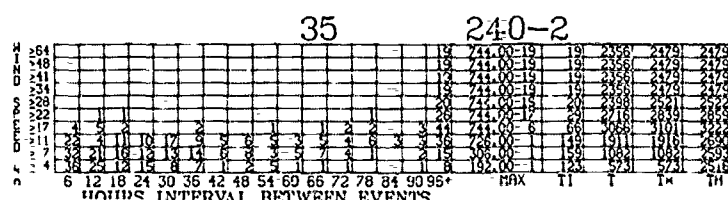
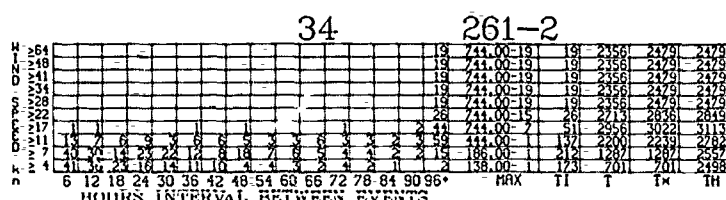
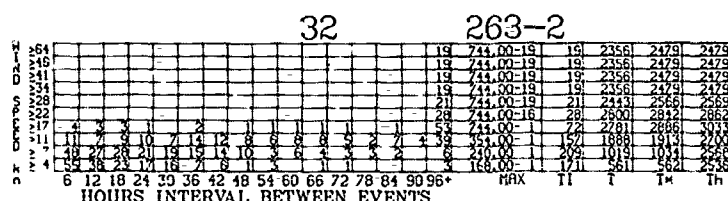
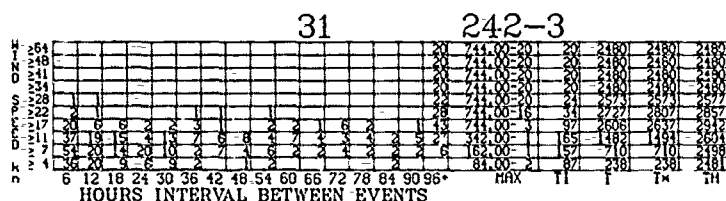
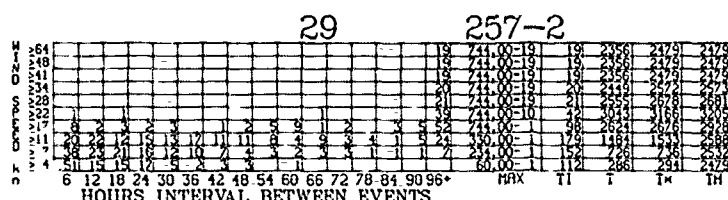
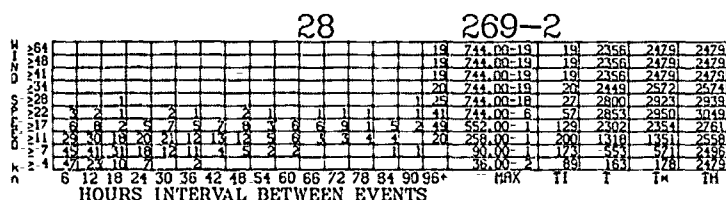
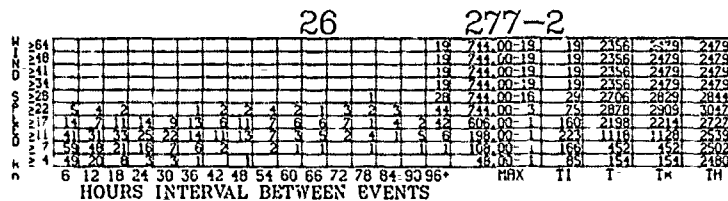
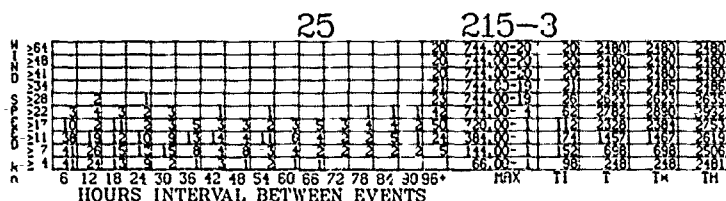
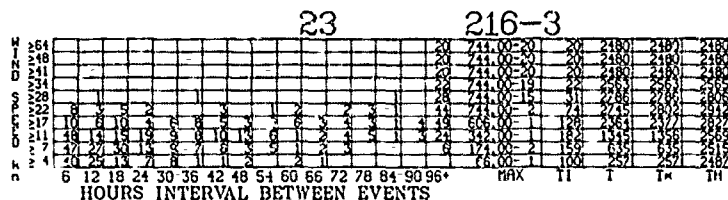
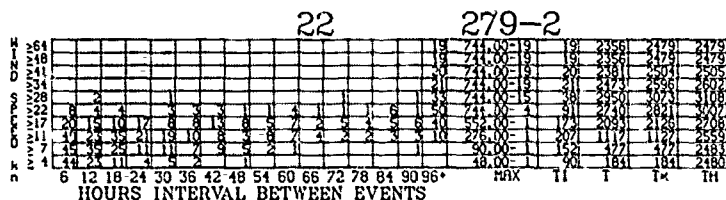


21 182-3



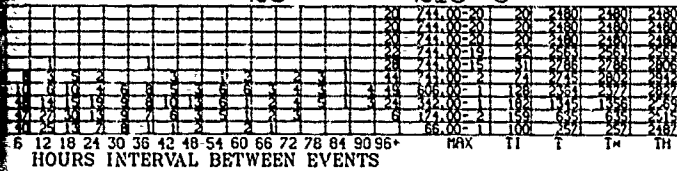
(2)

# WIND SPEED INTERVALS (Cont'd)

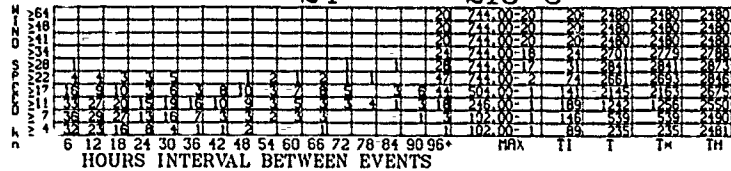


# AUGUST

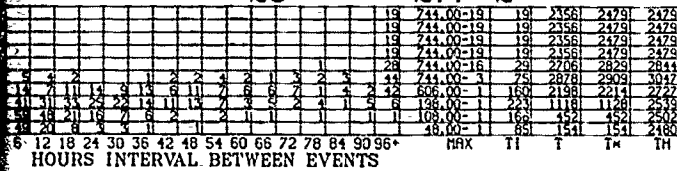
23 216-3



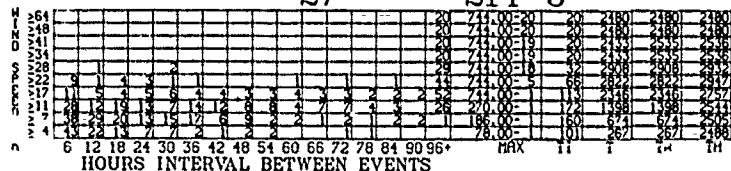
24 218-3



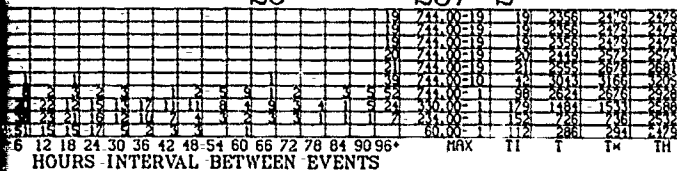
26 277-2



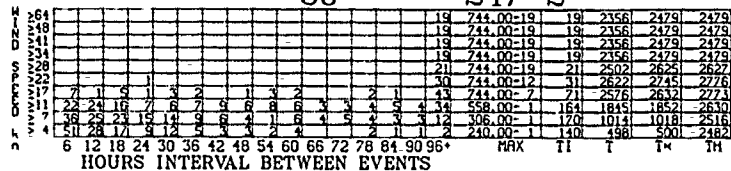
27 214-3



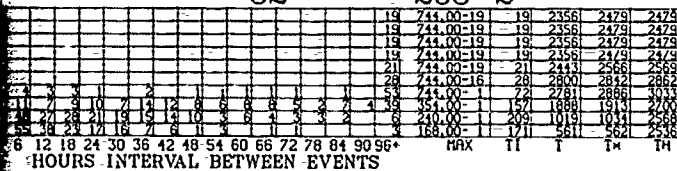
29 257-2



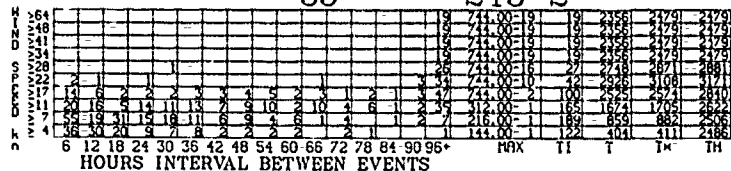
30 247-2



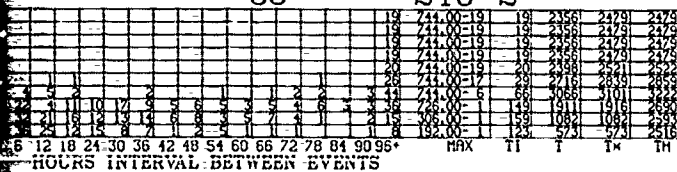
32 263-2



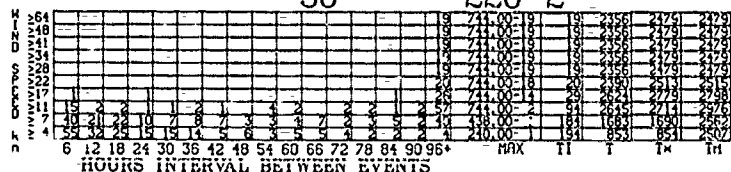
33 243-2



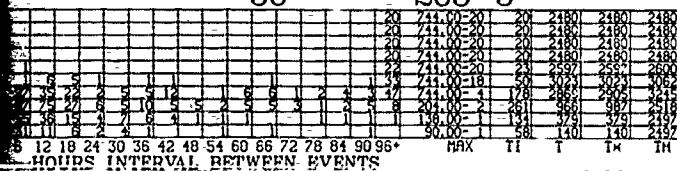
35 240-2



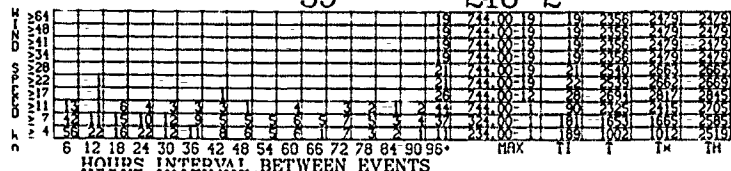
36 220-2



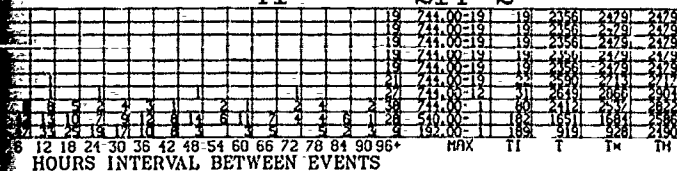
38 265-3



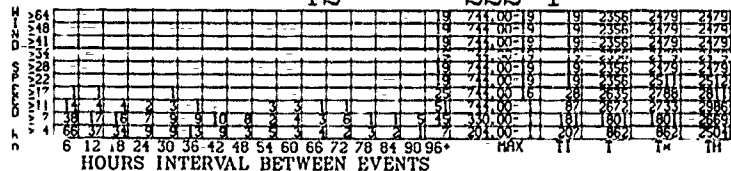
39 216-2



41 214-2

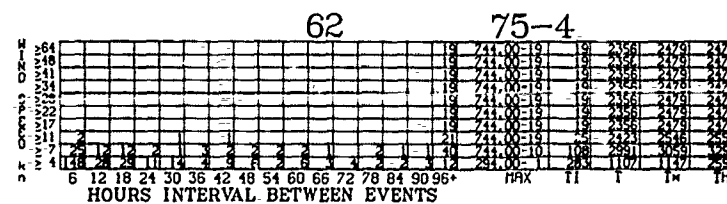
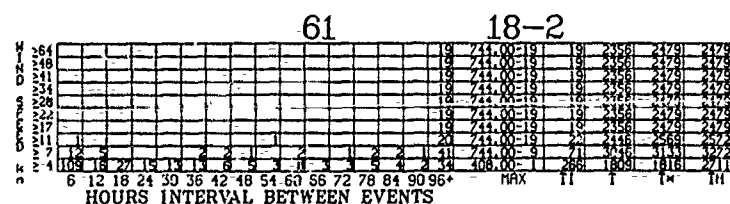
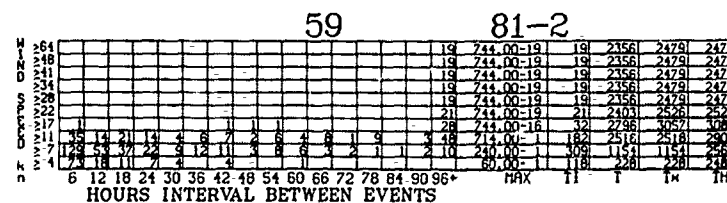
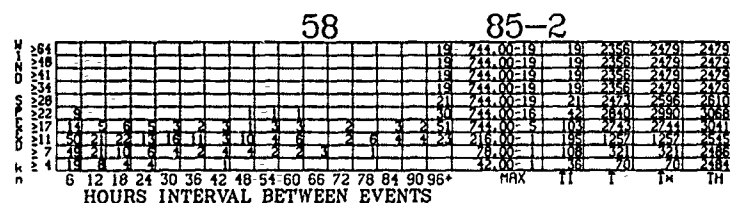
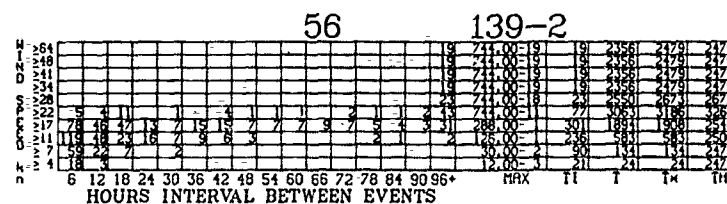
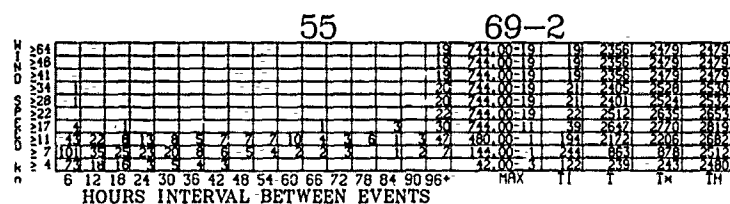
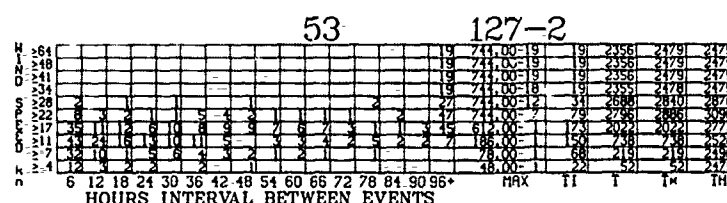
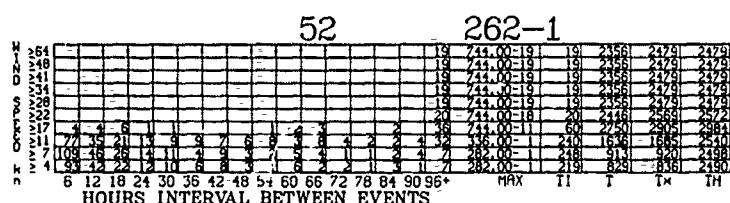
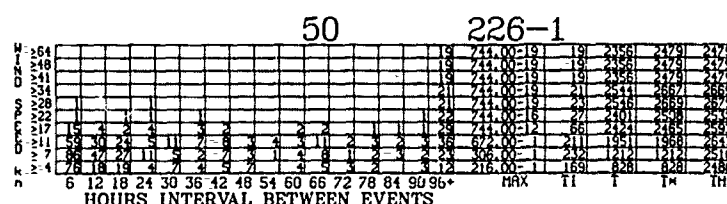
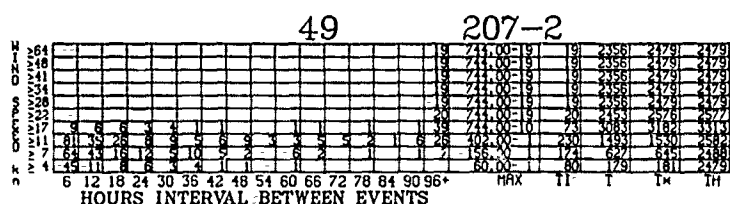
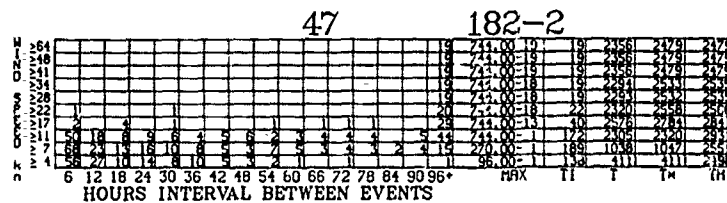
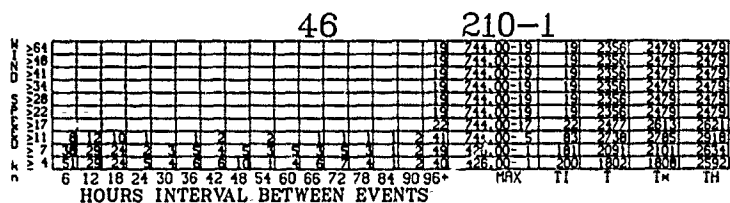
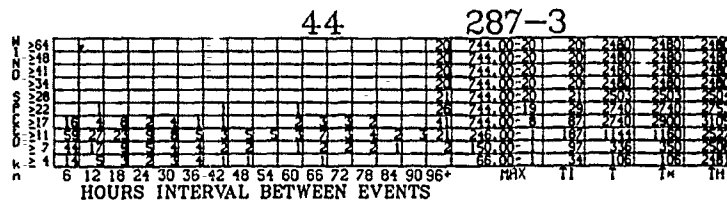
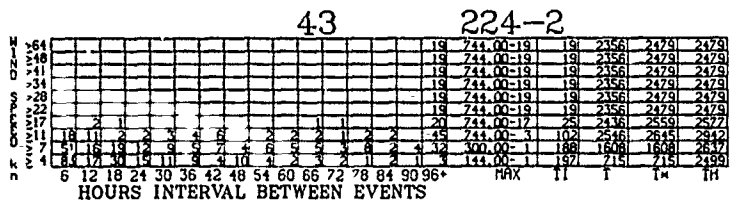


42 222-1



# AUGUST

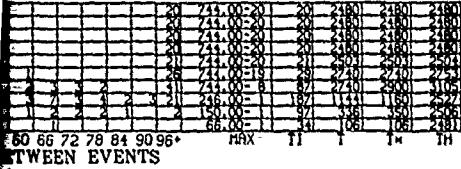
WI



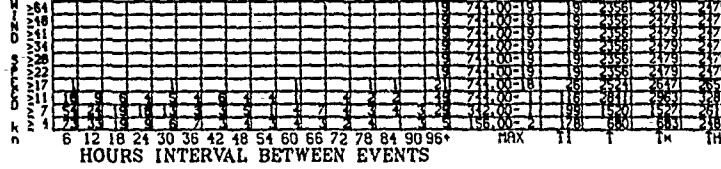


# WIND SPEED INTERVALS (Cont'd)

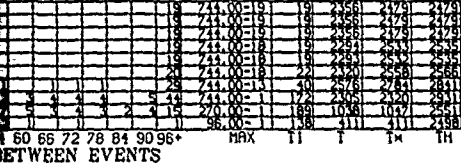
44 287-3



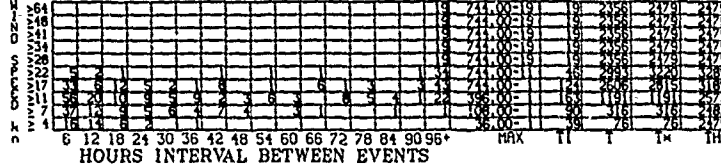
45 211-2



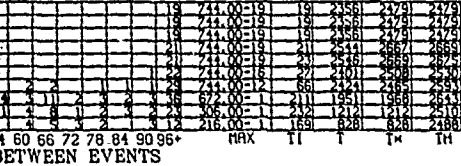
47 182-2



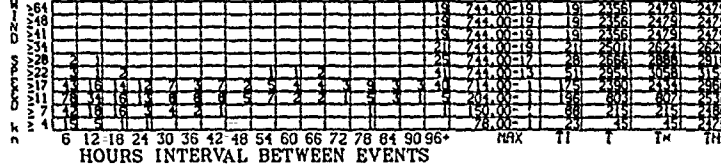
48 151-2



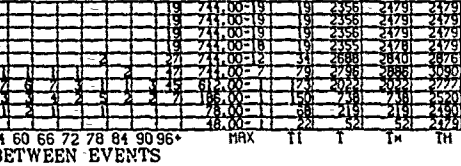
50 226-1



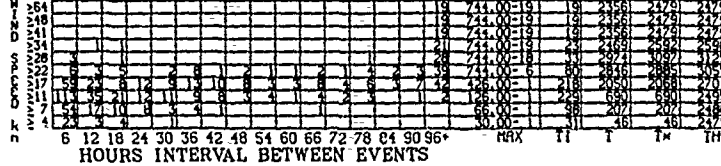
51 161-2



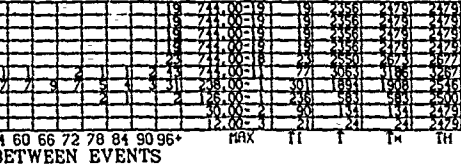
53 127-2



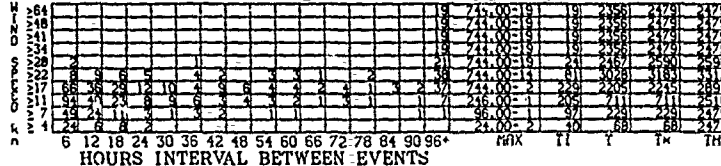
54 124-2



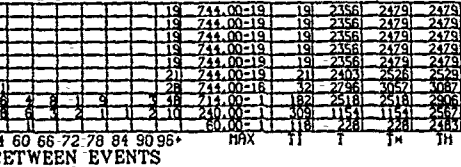
56 139-2



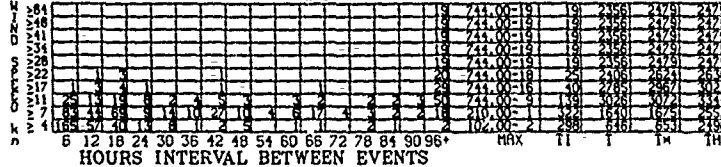
57 283-1



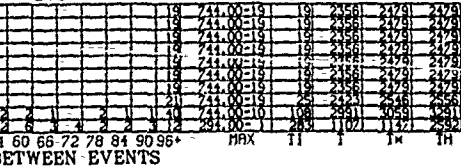
59 81-2



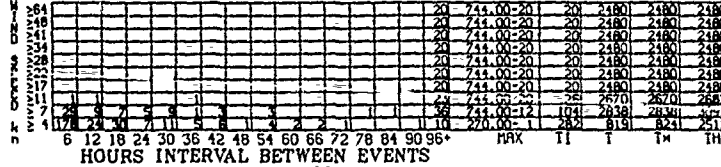
60 27-4



62 75-4

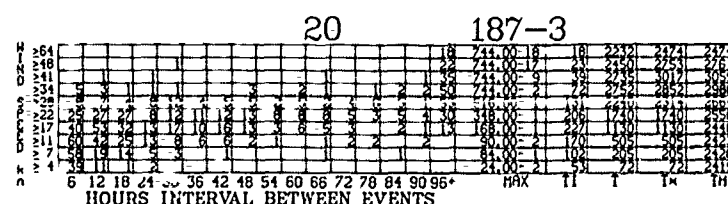
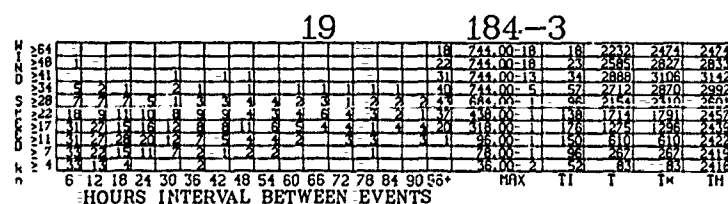
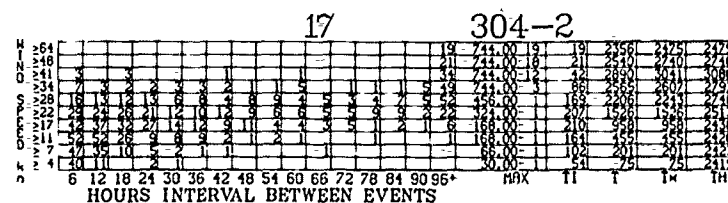
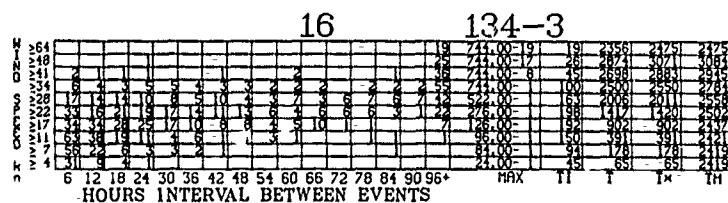
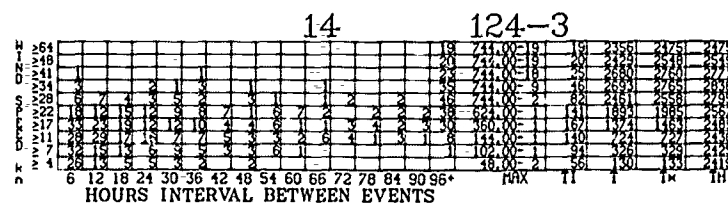
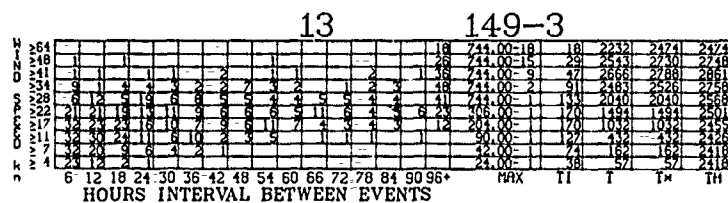
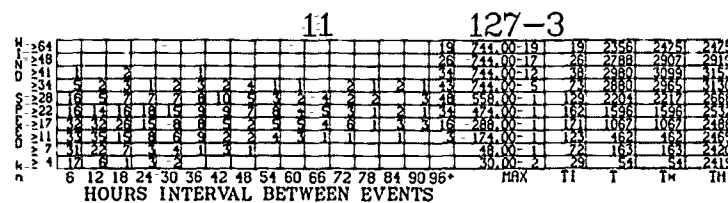
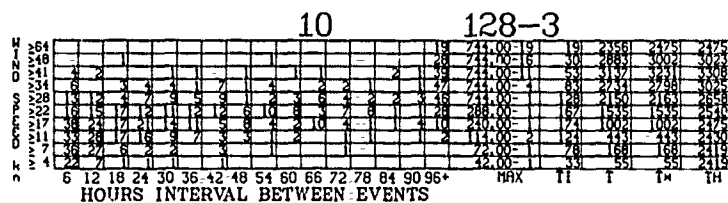
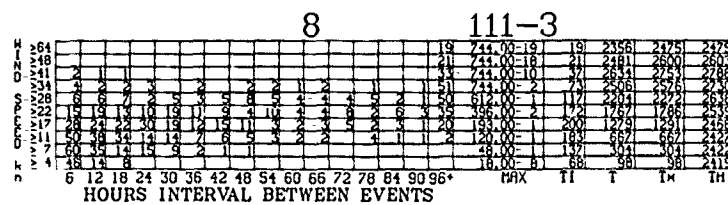
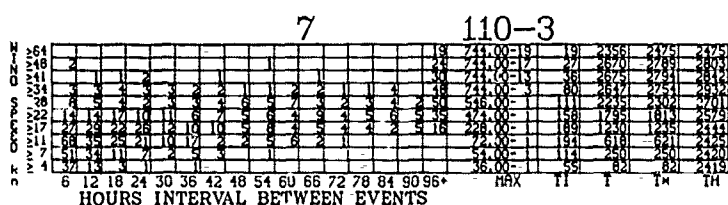
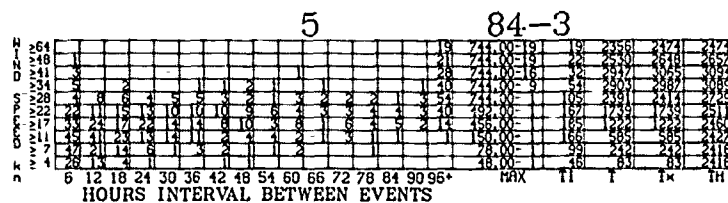
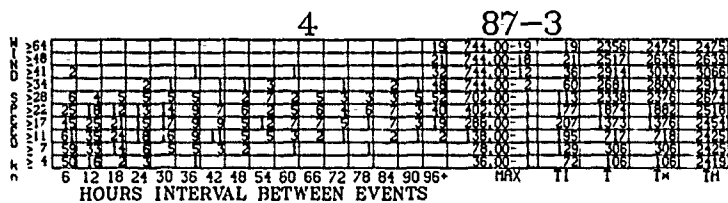
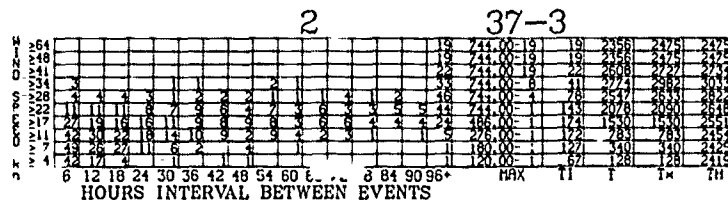
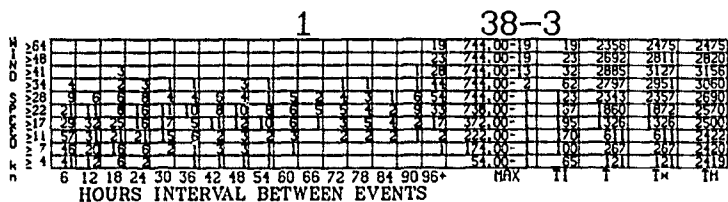


63 37-4



(2)

# WIND SPEED INTERVALS

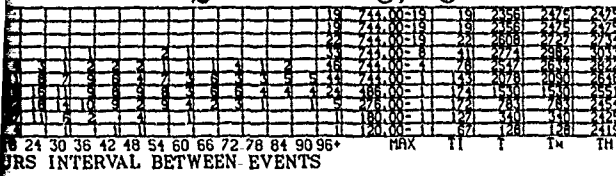




# OCTOBER

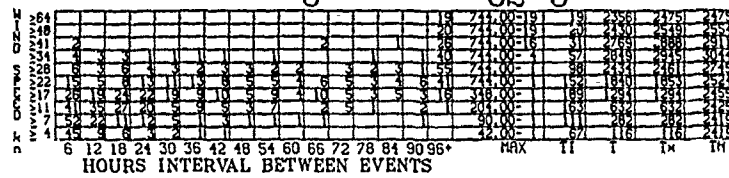
2

37-3



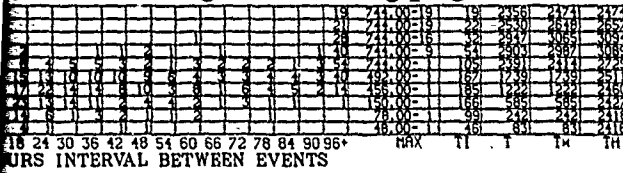
3

62-3



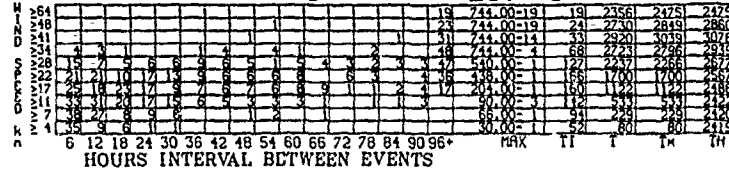
5

84-3



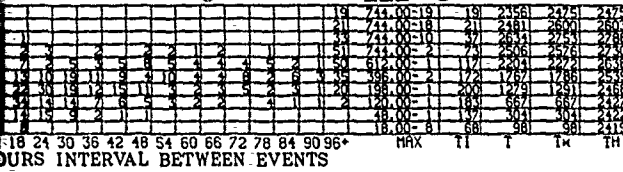
6

107-3



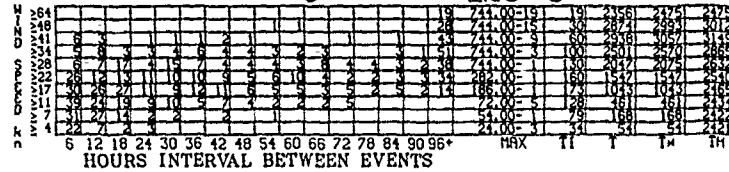
8

111-3



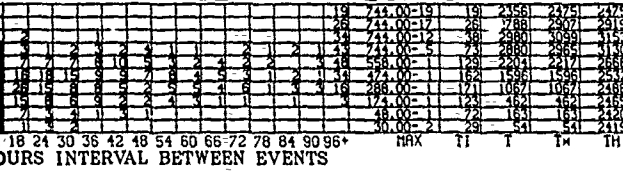
9

129-3



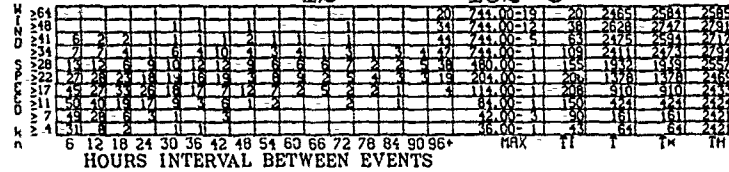
11

127-3



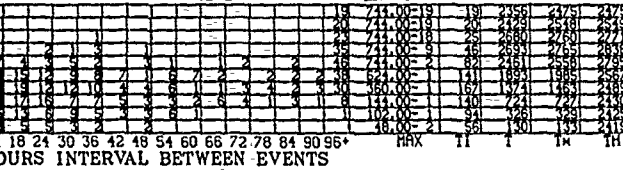
12

132-3



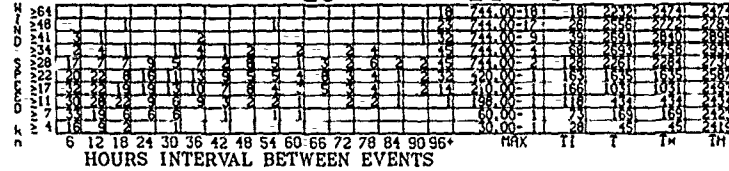
14

124-3



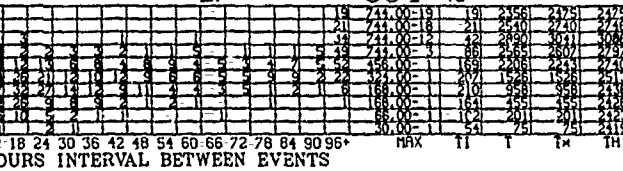
15

147-3



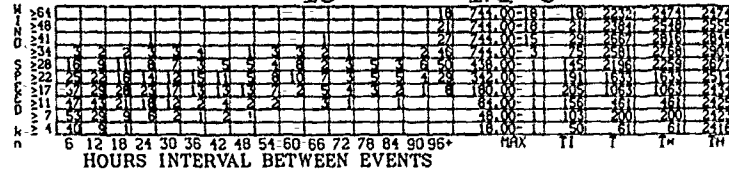
17

304-2



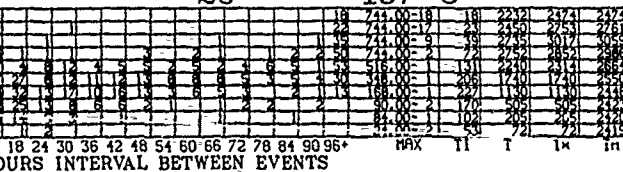
18

171-3



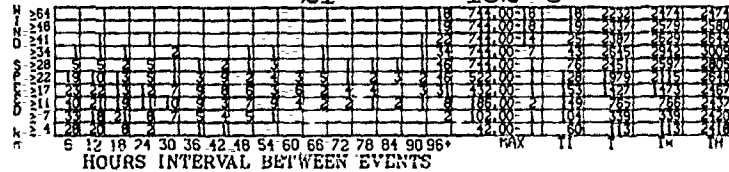
20

187-3



21

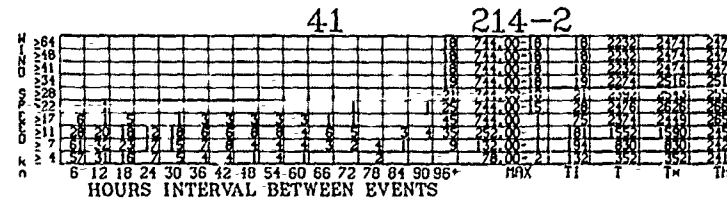
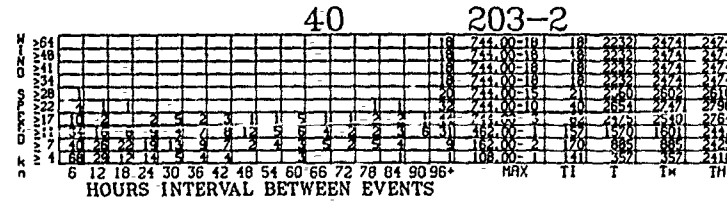
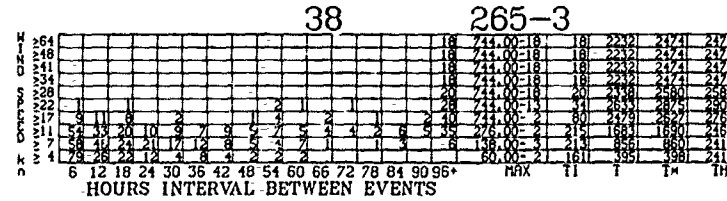
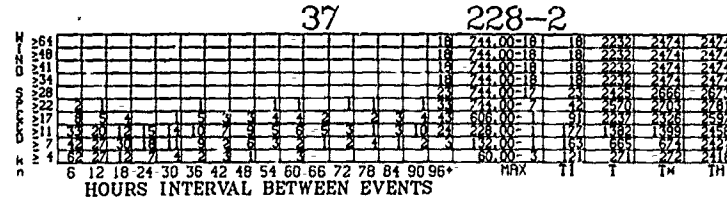
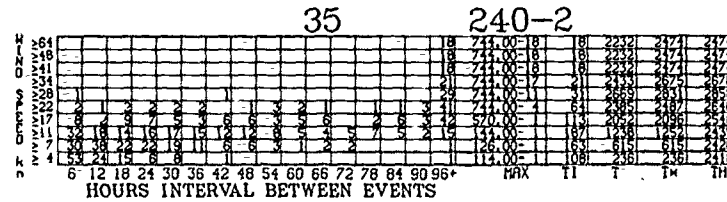
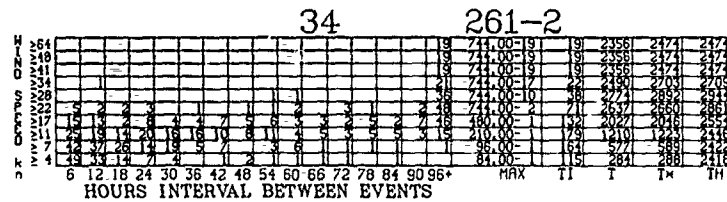
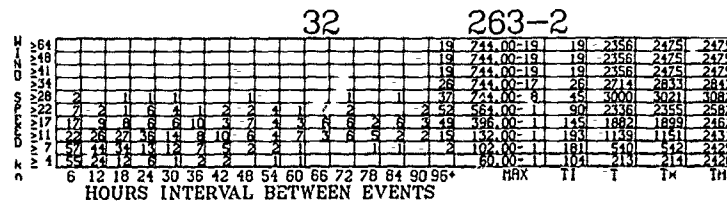
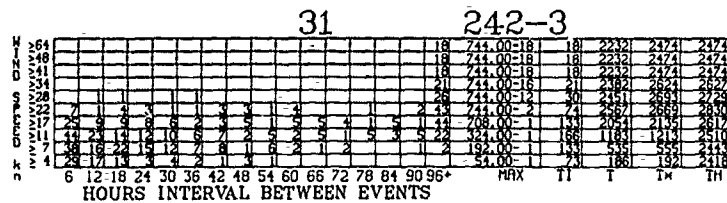
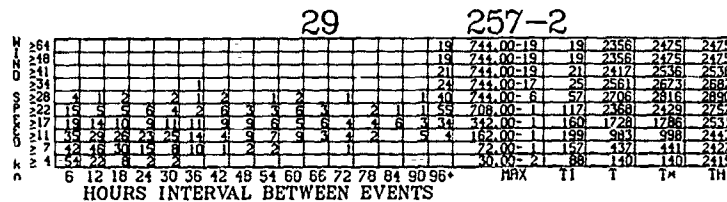
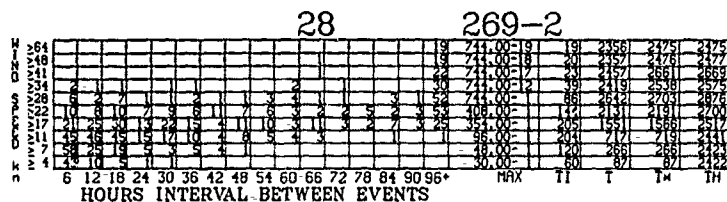
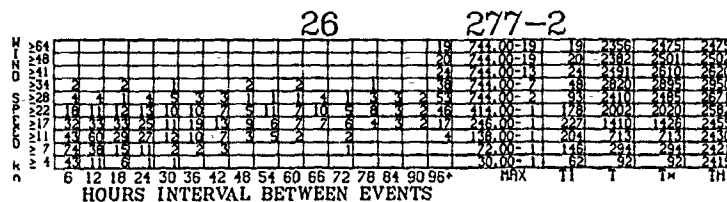
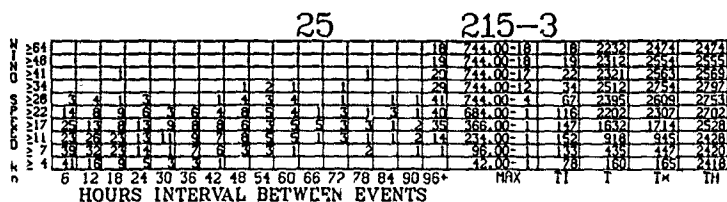
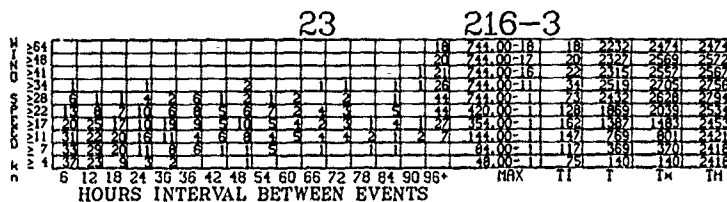
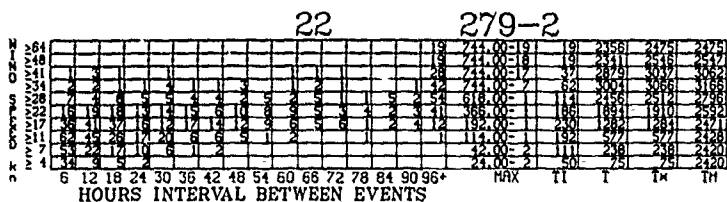
182-3



2

# OCTOBER

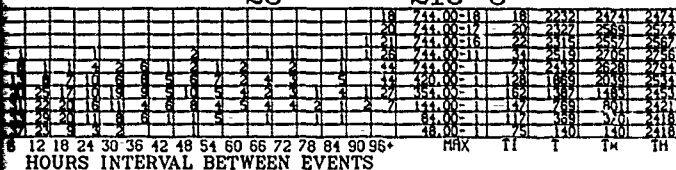
WIN



# WIND SPEED INTERVALS (Cont'd)

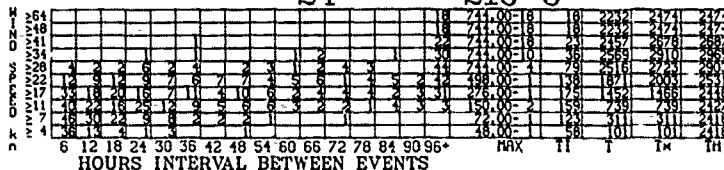
23

216-3



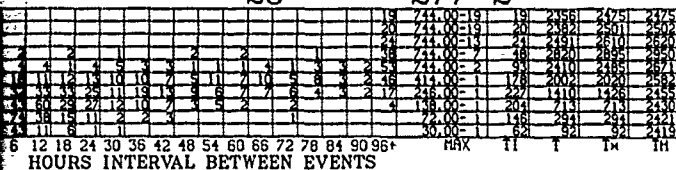
24

218-3



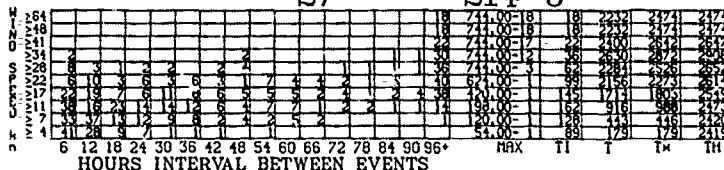
26

277-2



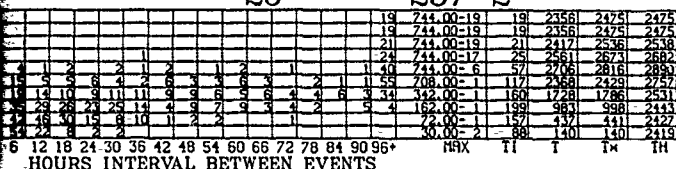
27

214-3



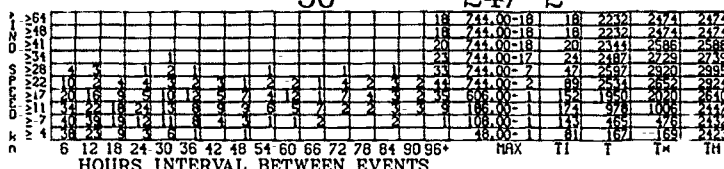
29

257-2



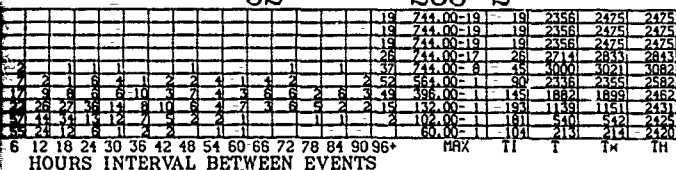
30

247-2



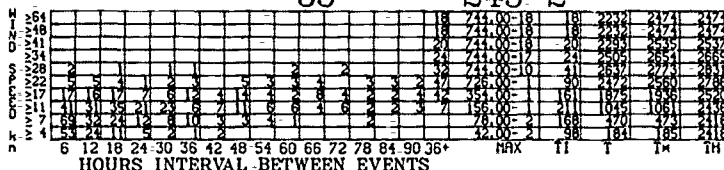
32

263-2



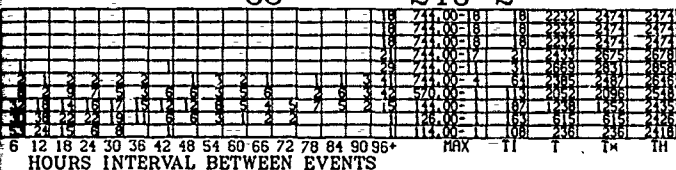
33

243-2



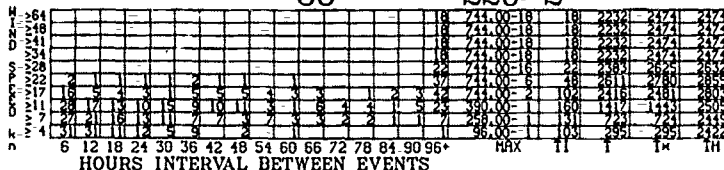
35

240-2



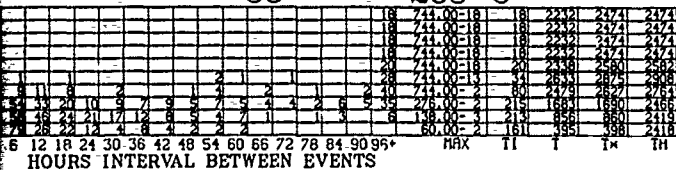
36

220-2



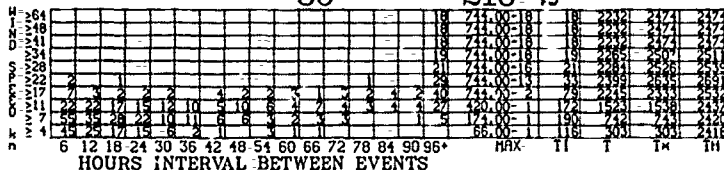
38

265-3



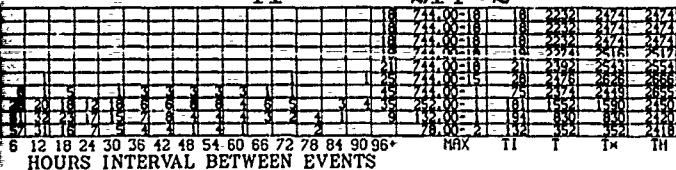
39

216-2



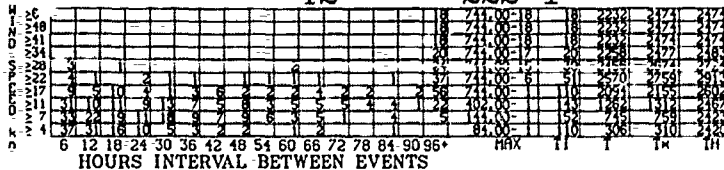
41

214-2

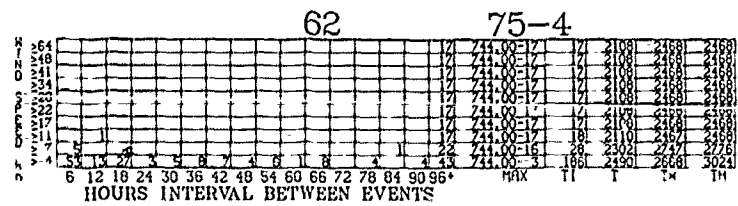
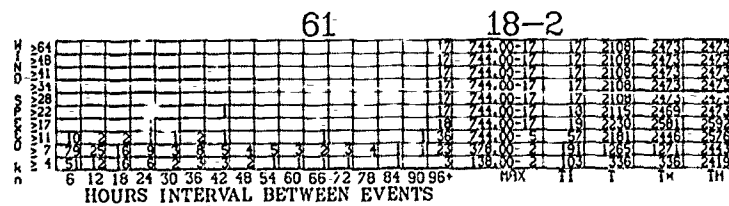
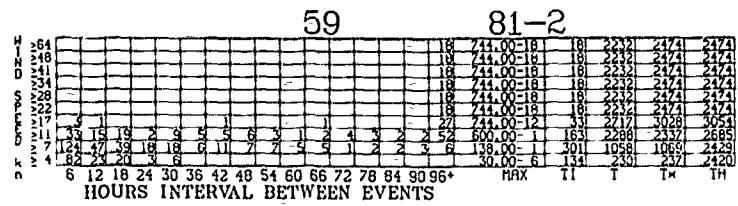
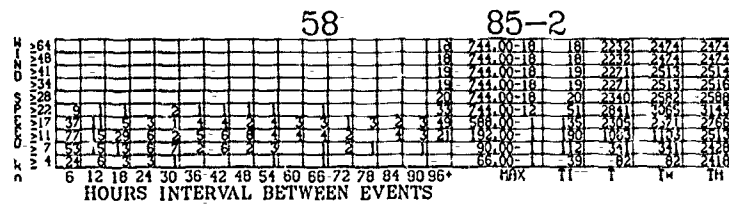
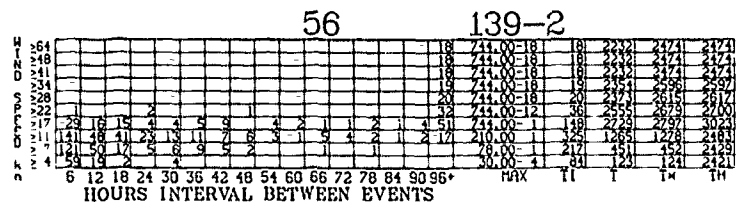
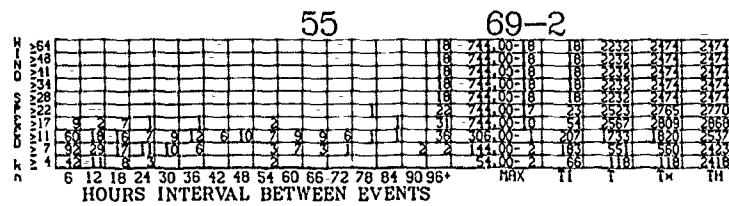
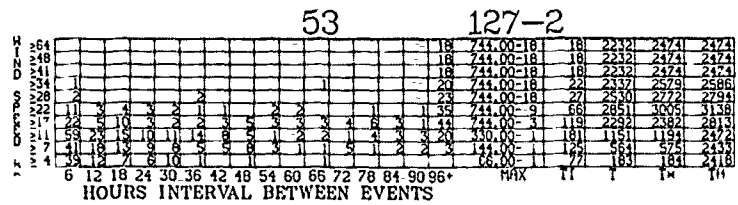
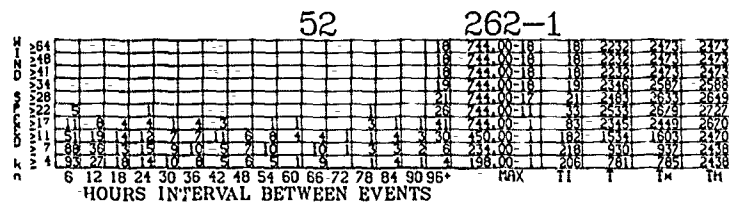
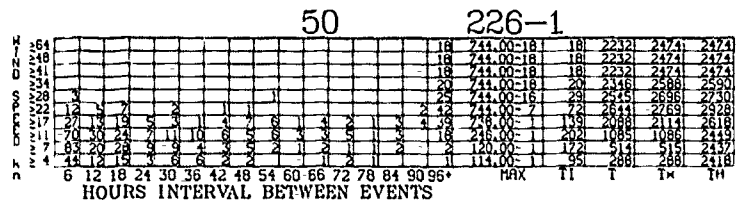
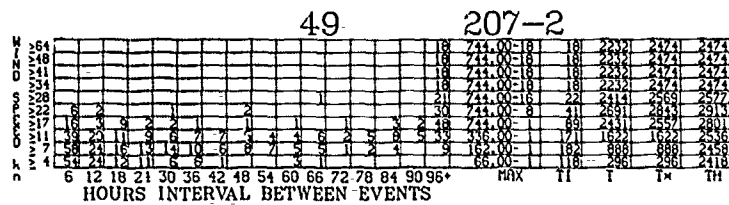
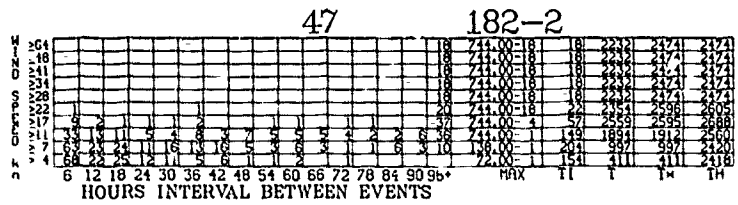
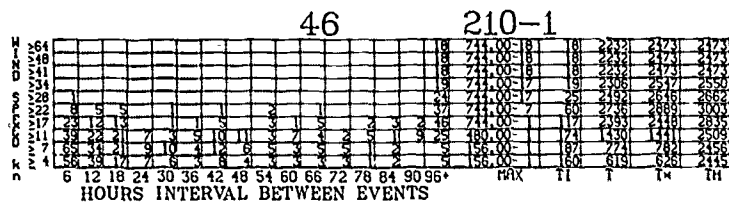
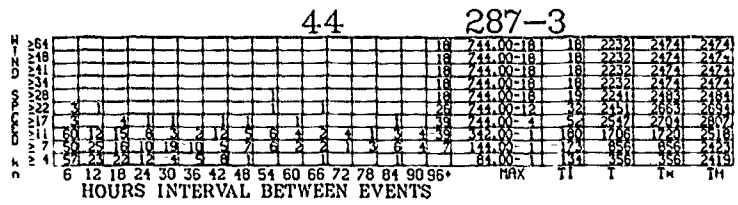
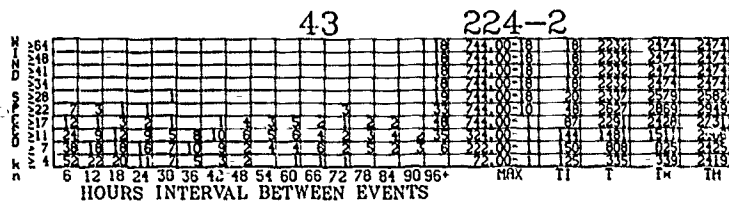


42

222-1

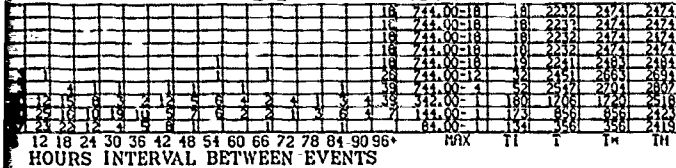


# WIND SPEED INTERVALS (Cont'd)

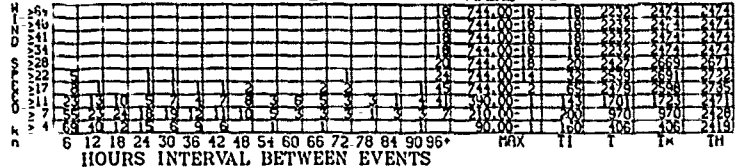


# OCTOBER

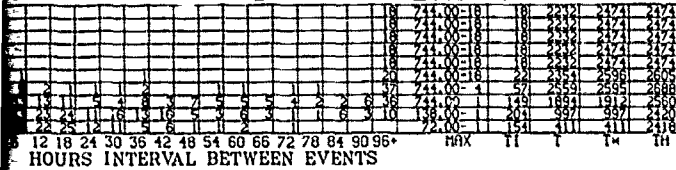
44 287-3



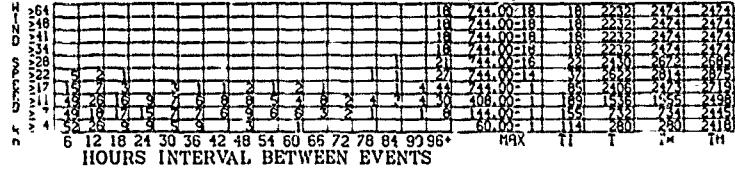
45 211-2



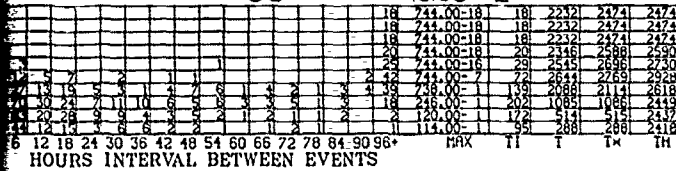
47 182-2



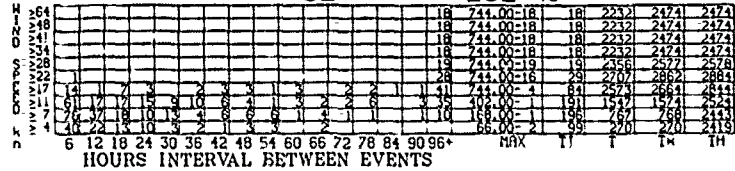
48 151-2



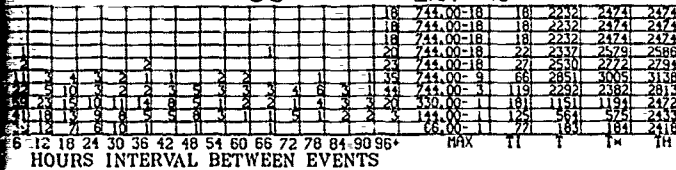
50 226-1



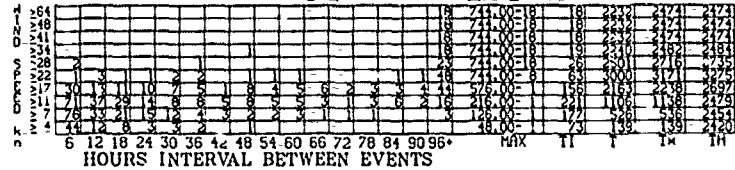
51 161-2



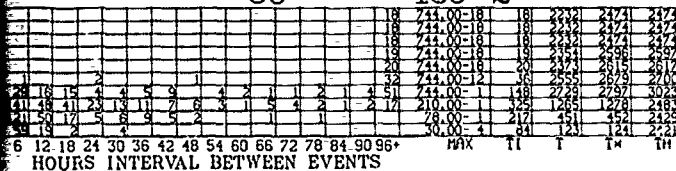
53 127-2



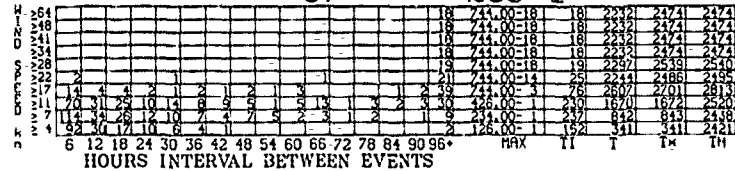
54 124-2



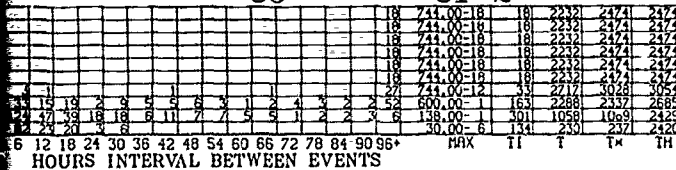
56 139-2



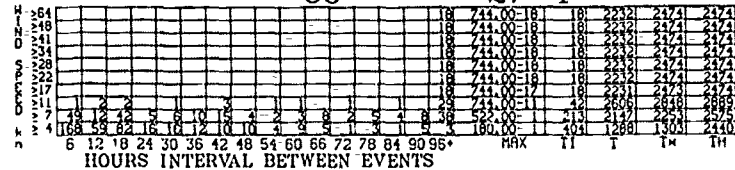
57 283-1



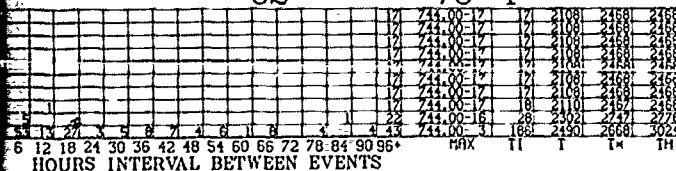
59 81-2



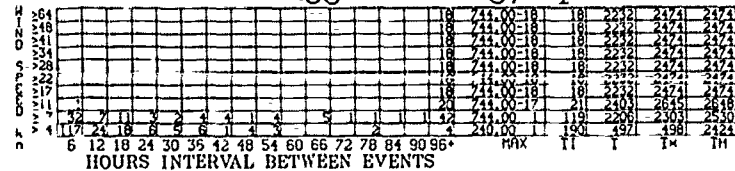
60 27-4



62 75-4



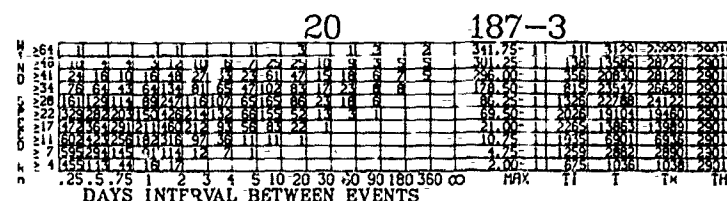
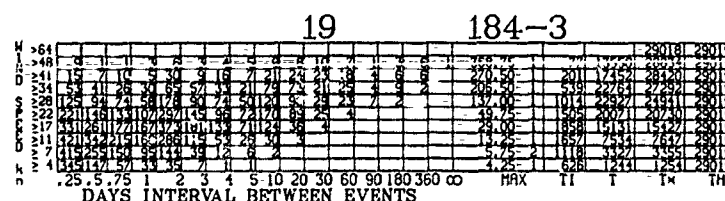
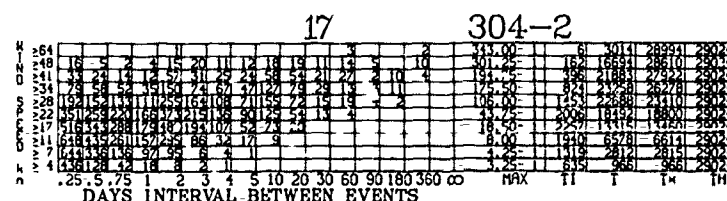
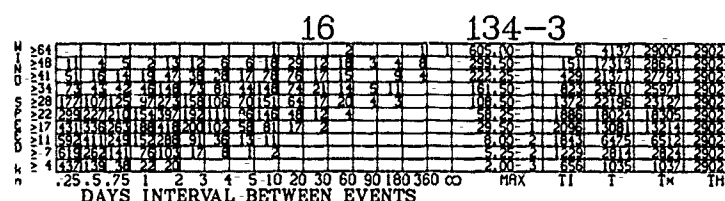
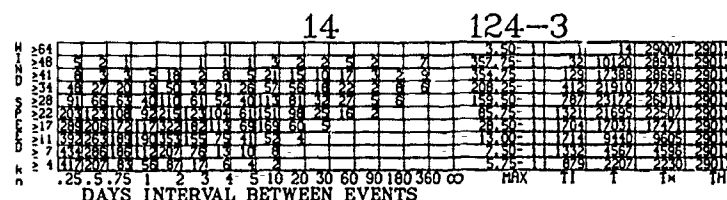
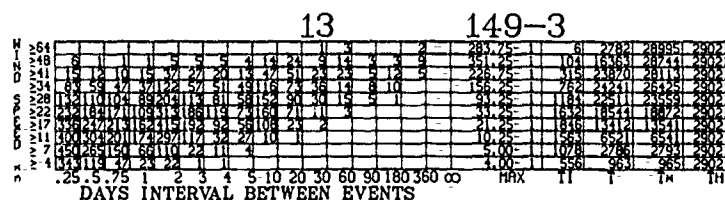
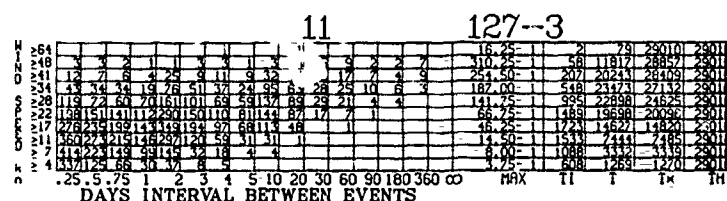
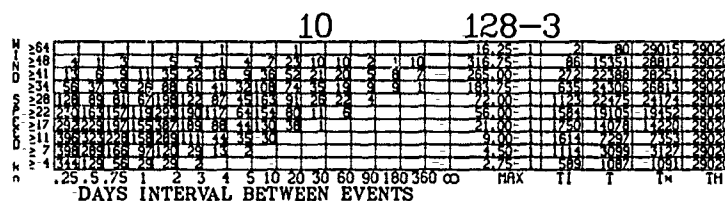
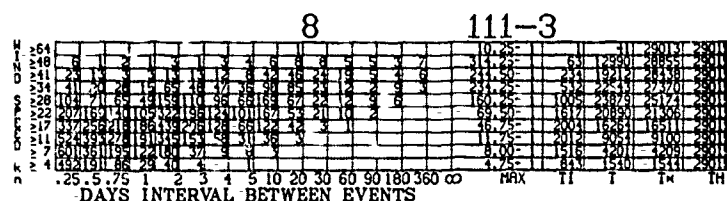
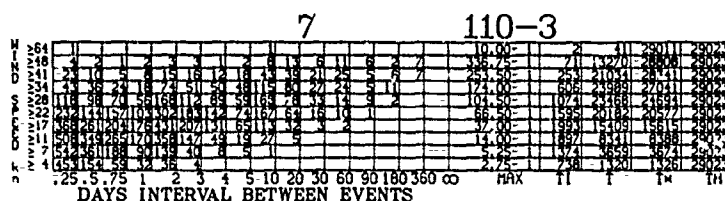
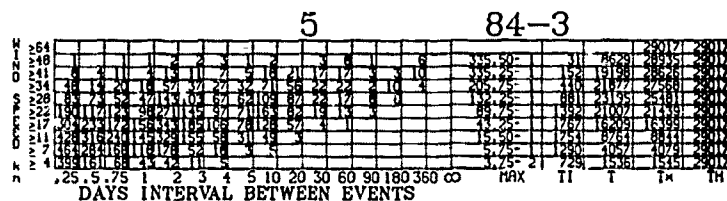
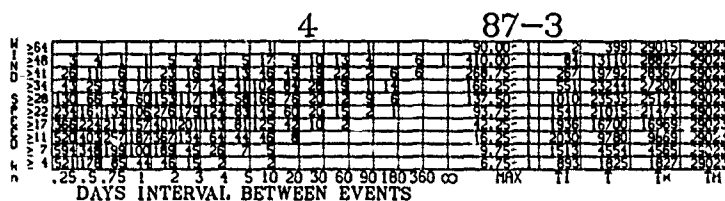
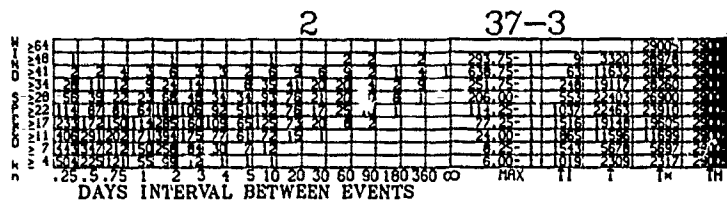
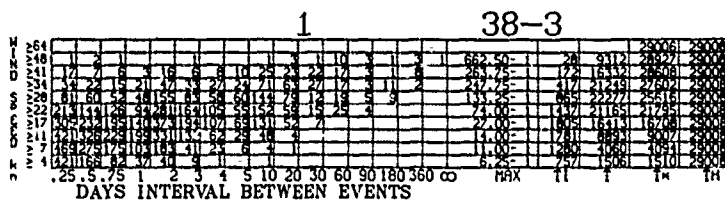
63 37-4



2



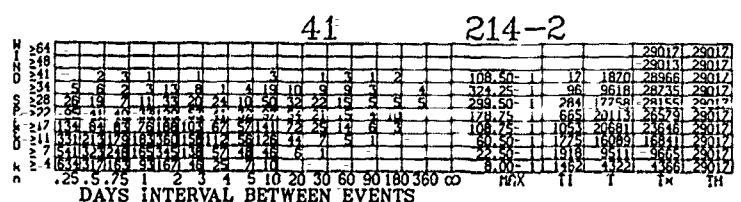
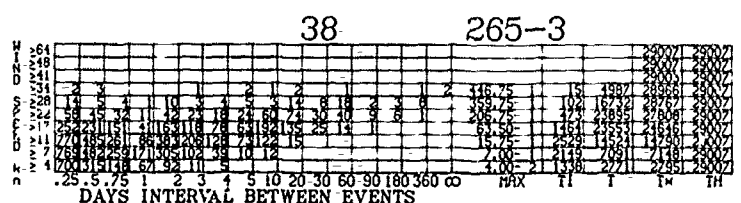
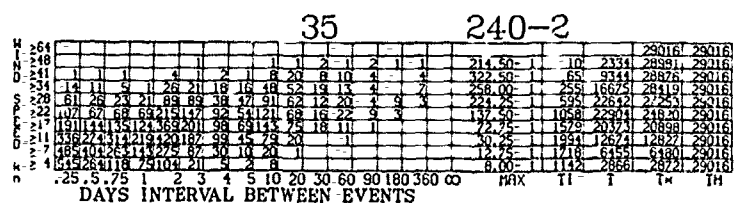
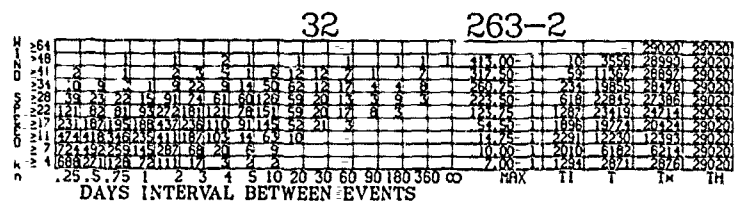
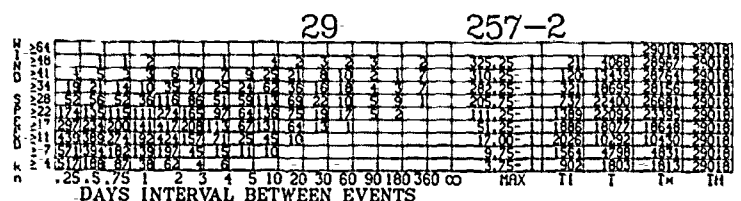
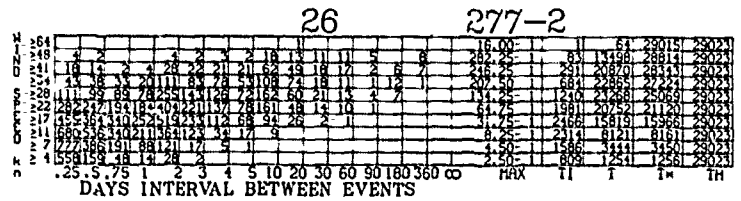
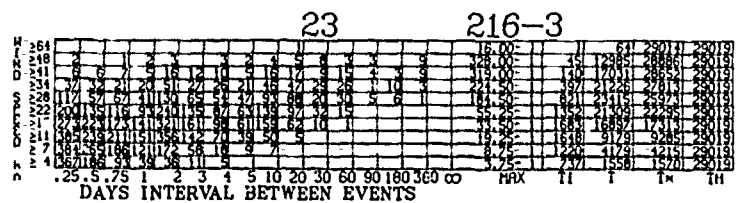
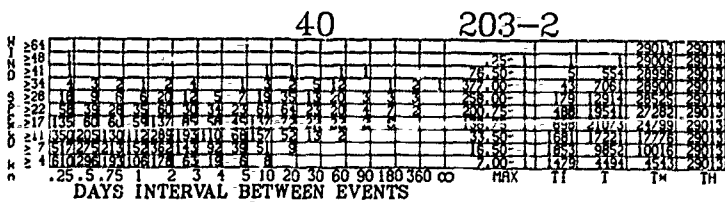
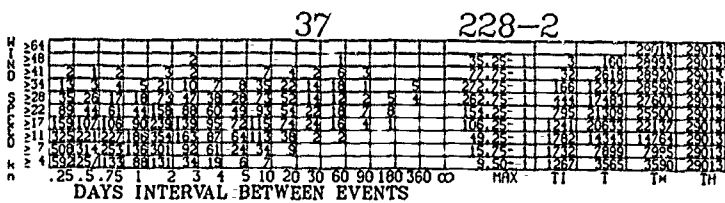
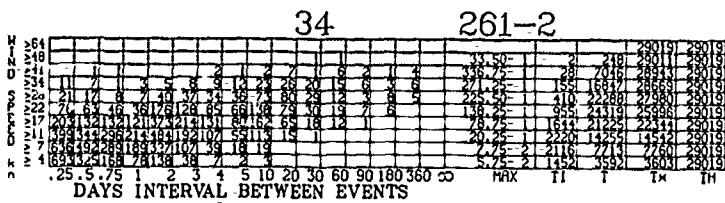
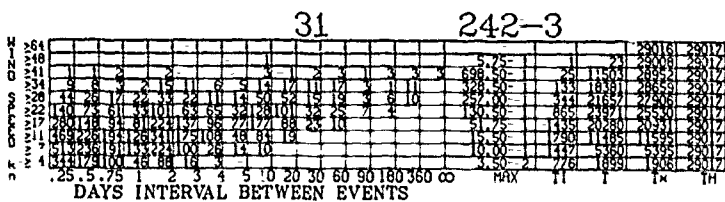
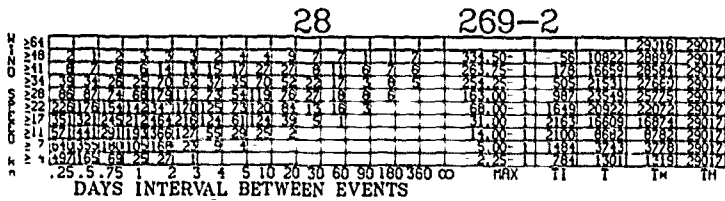
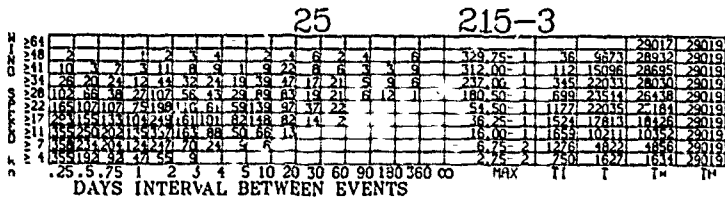
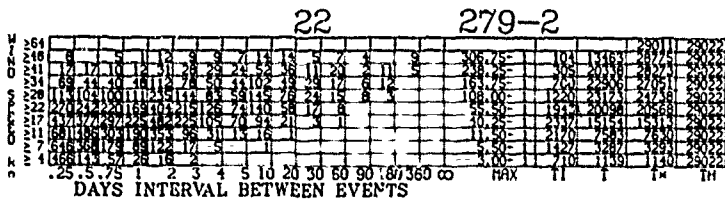
# ALL DAYS







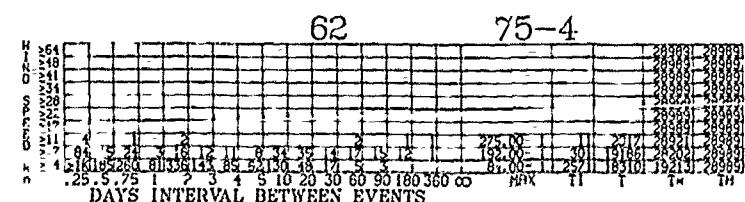
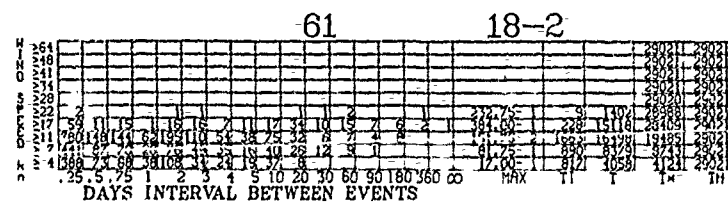
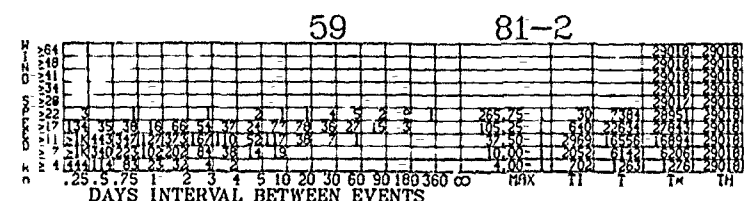
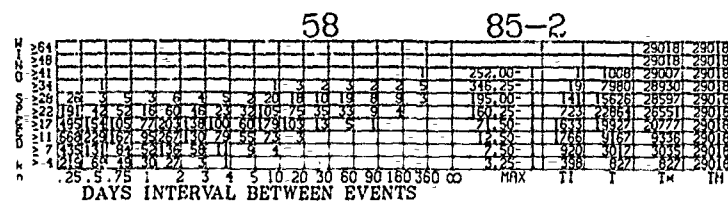
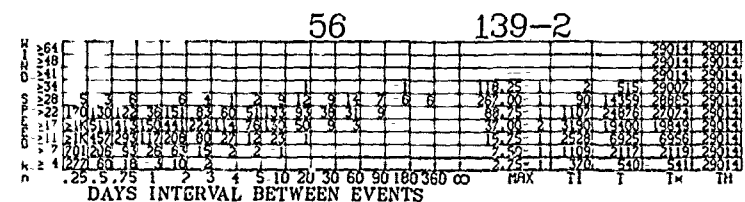
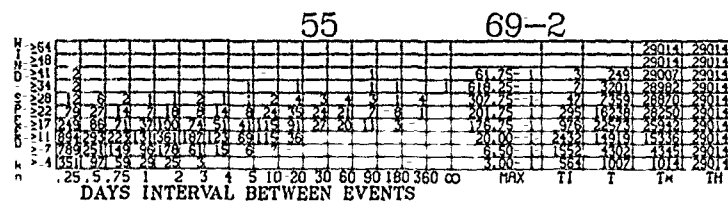
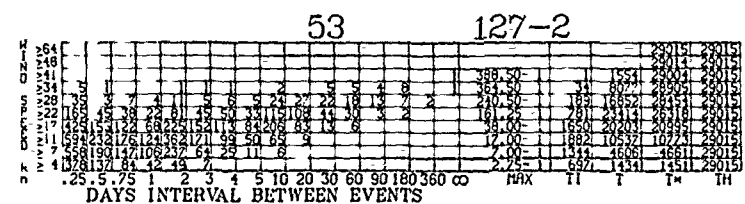
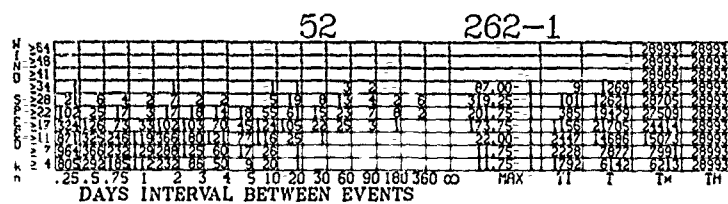
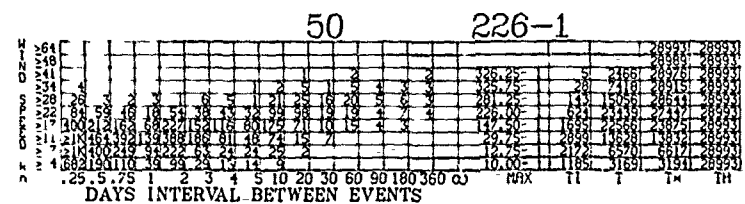
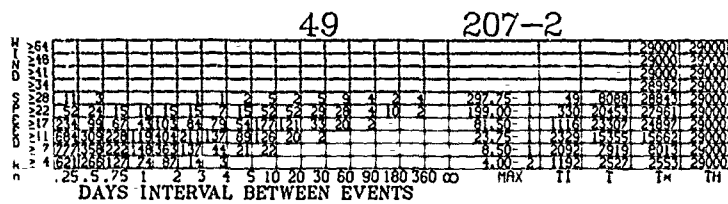
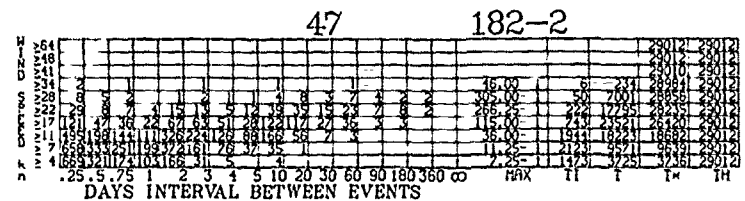
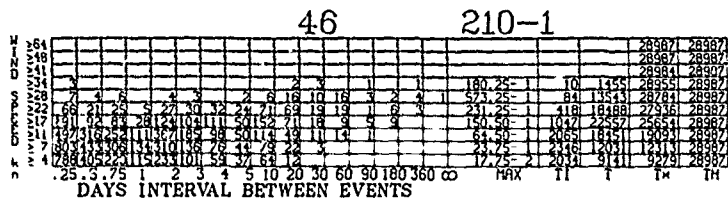
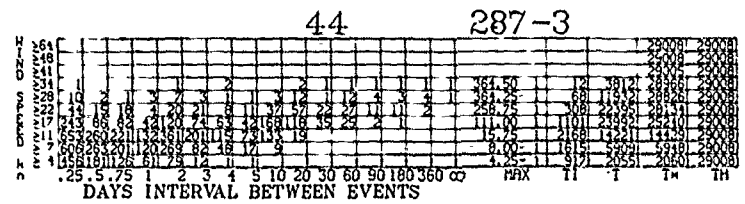
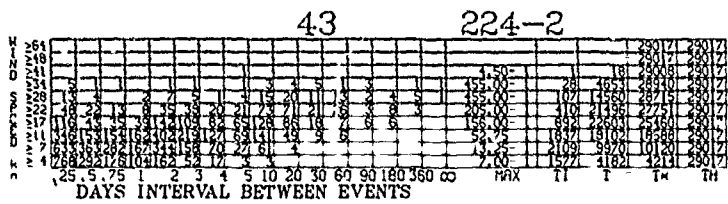
# WIND SPEED INTERVALS (Cont'd)





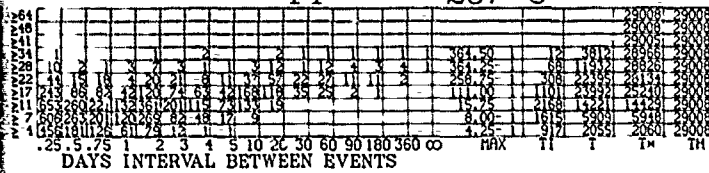
# ALL DAYS

W

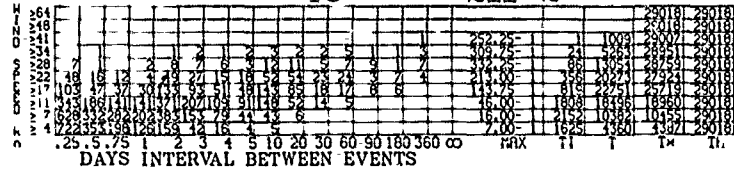


# WIND SPEED INTERVALS (Cont'd)

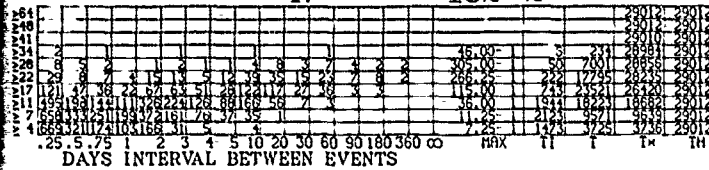
44 287-3



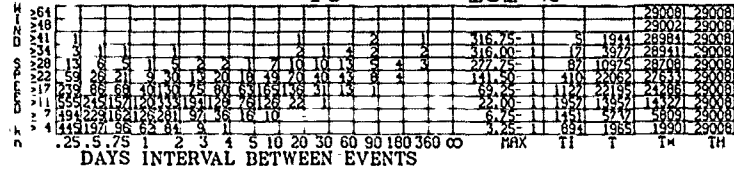
45 211-2



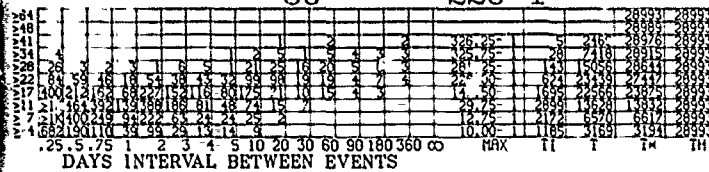
47 182-2



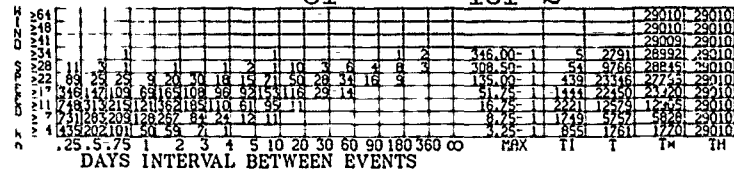
48 151-2



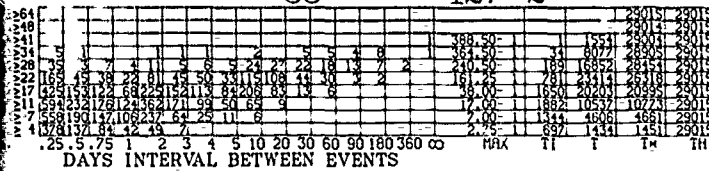
50 226-1



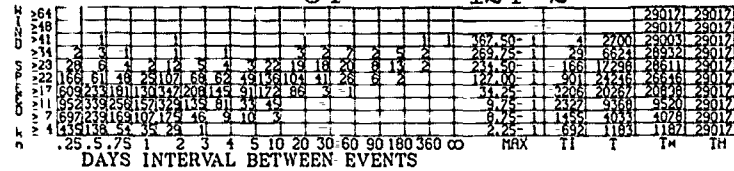
51 161-2



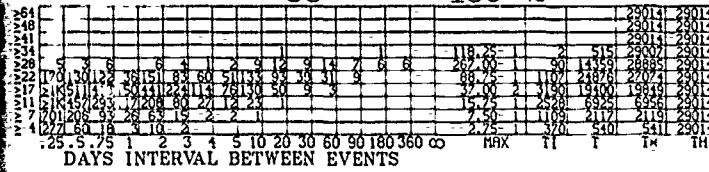
53 127-2



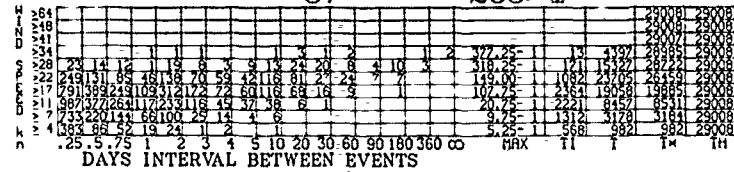
54 124-2



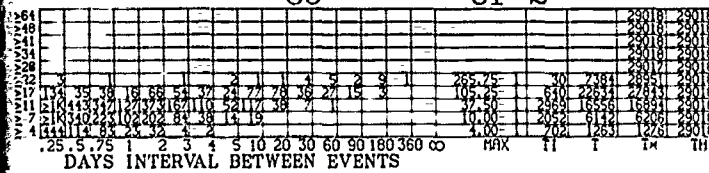
56 139-2



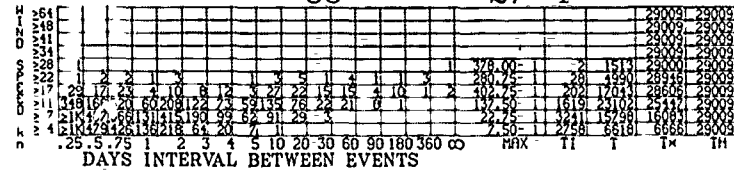
57 283-1



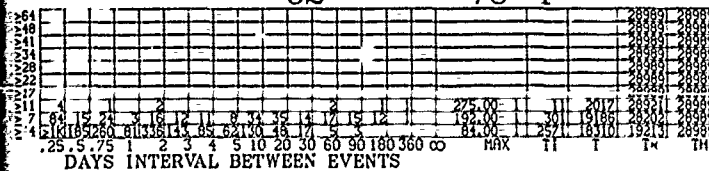
59 81-2



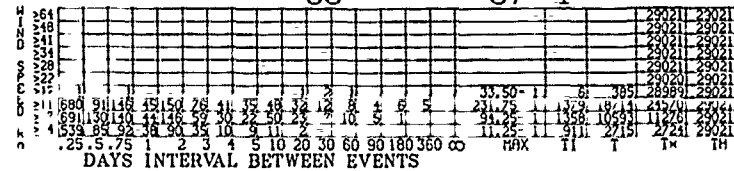
60 27-4



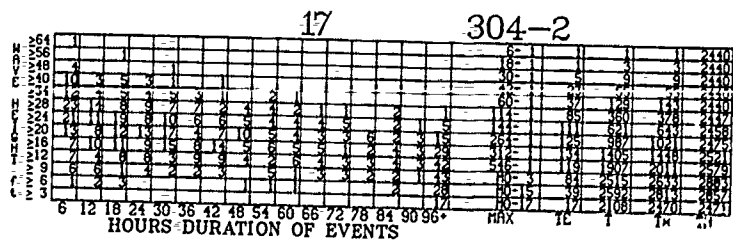
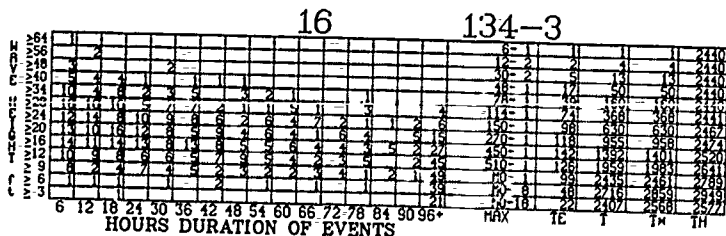
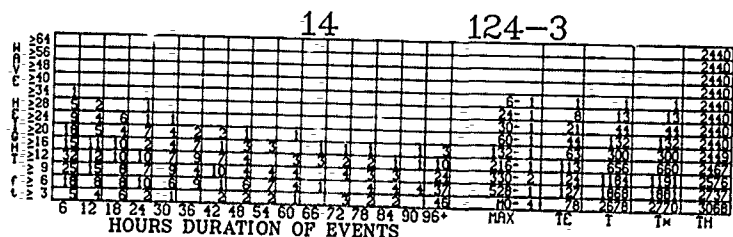
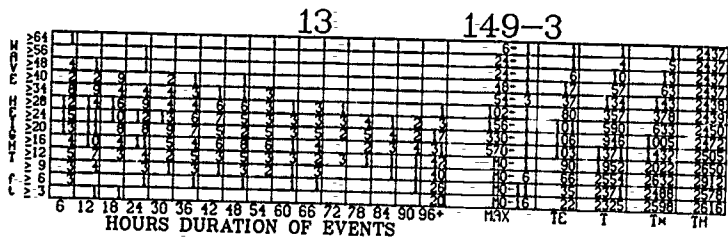
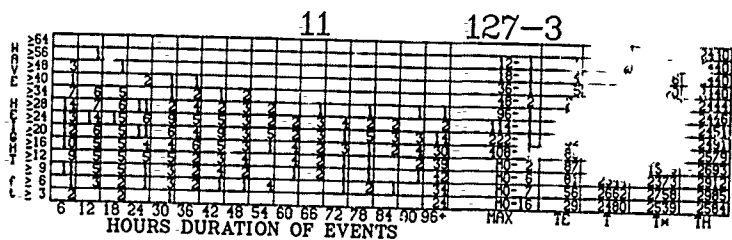
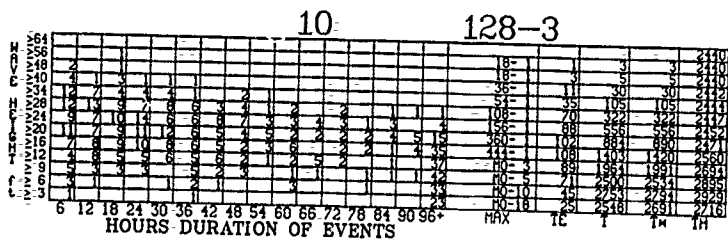
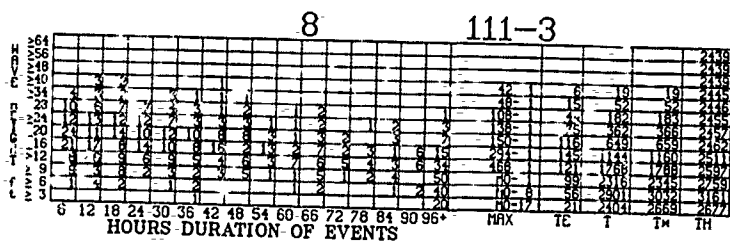
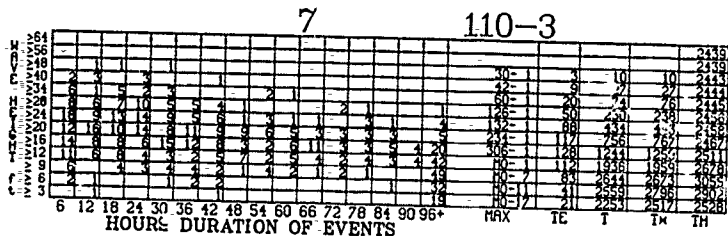
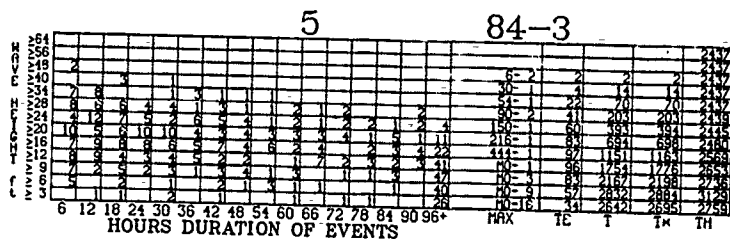
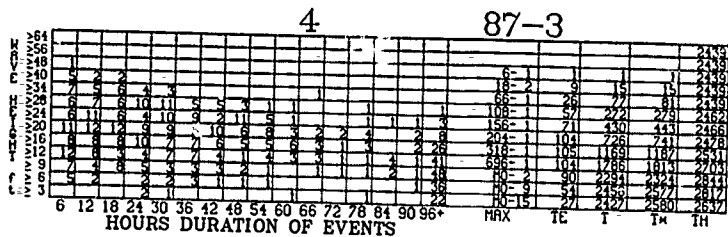
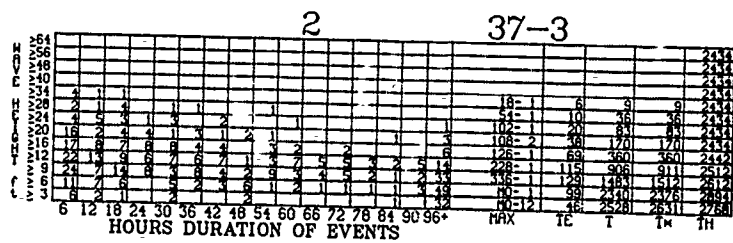
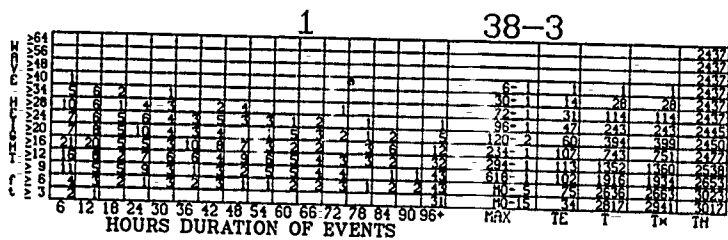
62 75-4



63 37-4



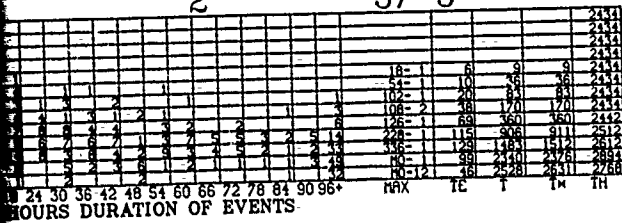
## WAVE HEIGHT DURATIONS



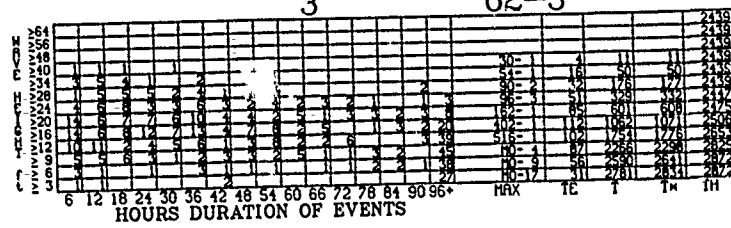


# JANUARY

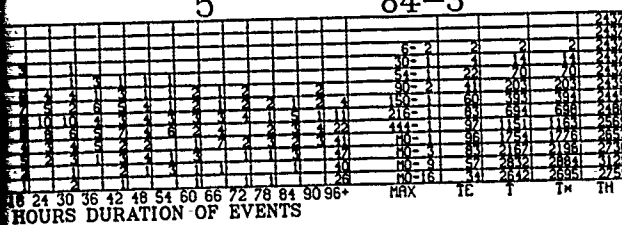
2 37-3



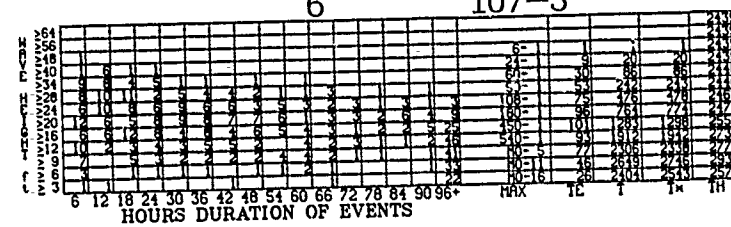
3 62-3



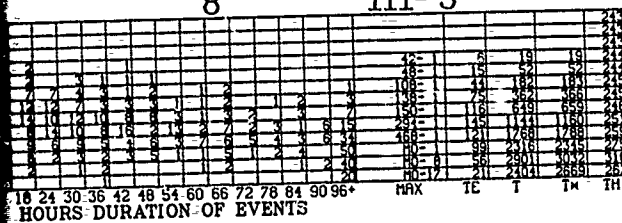
5 84-3



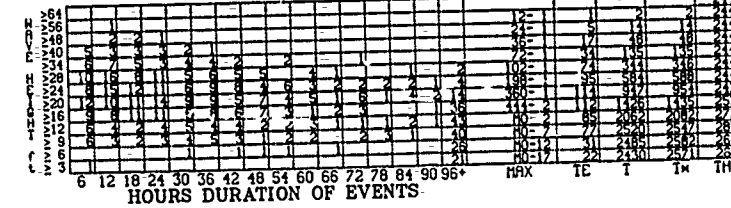
6 107-3



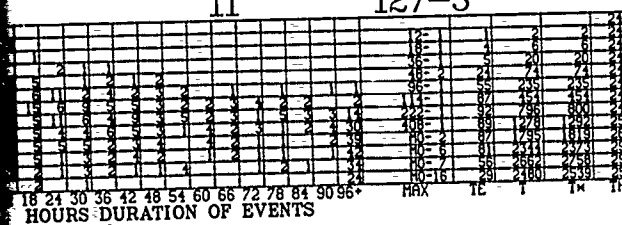
8 111-3



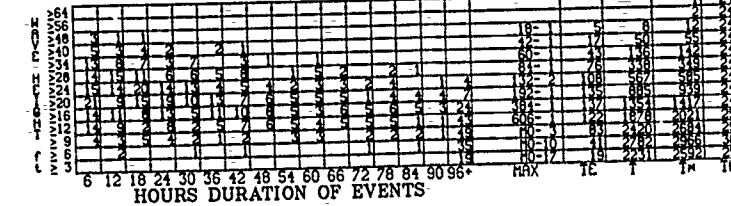
9 129-3



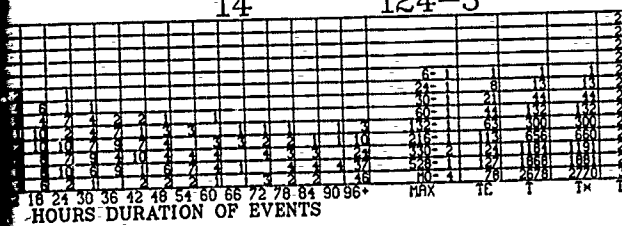
11 127-3



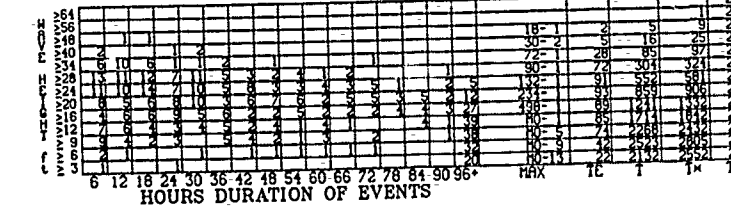
12 132-3



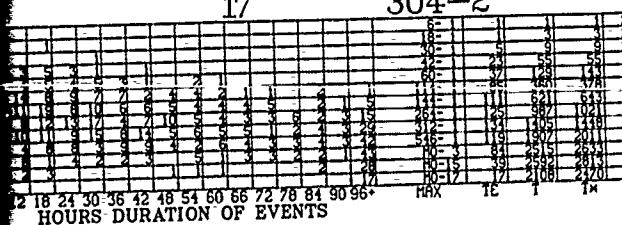
14 124-3



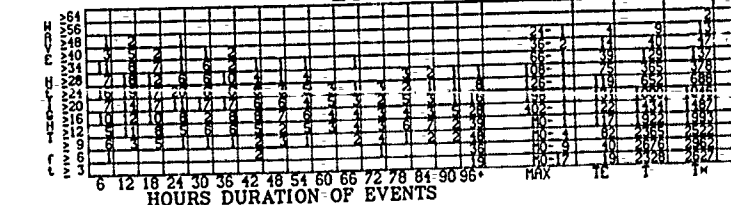
15 147-3



17 304-2



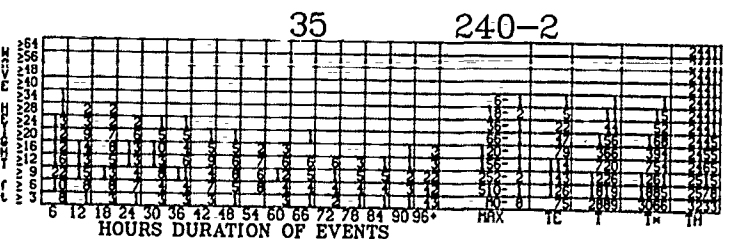
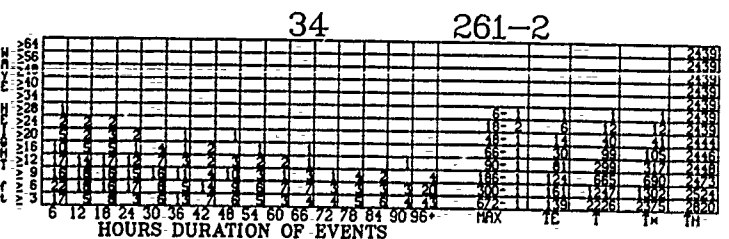
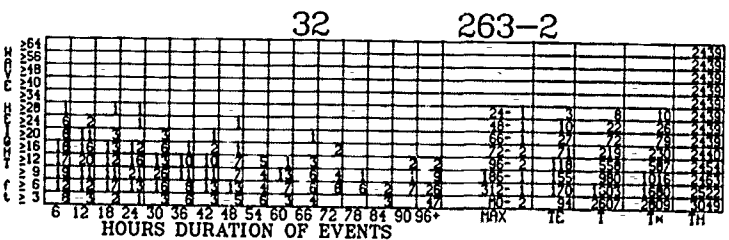
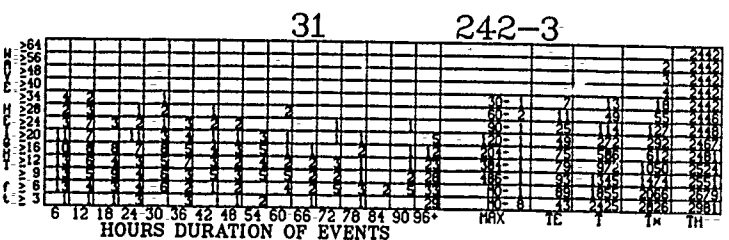
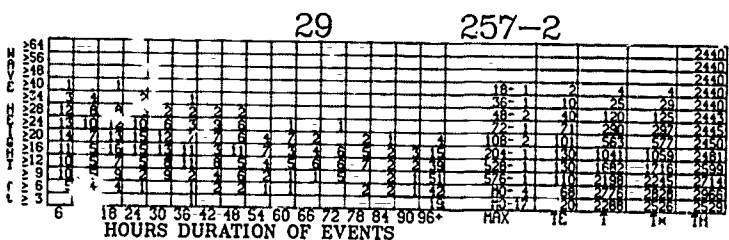
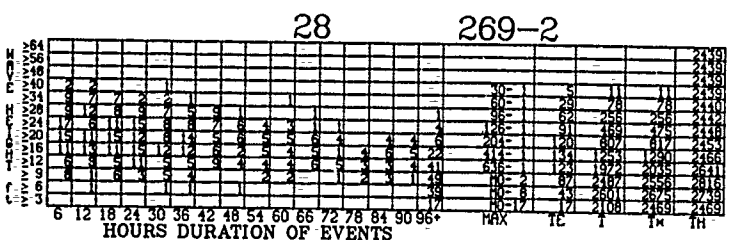
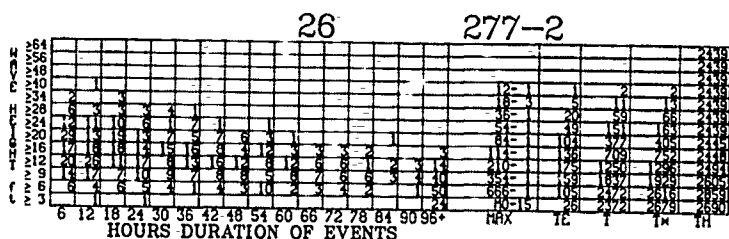
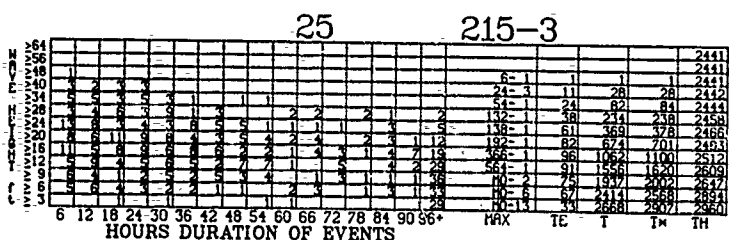
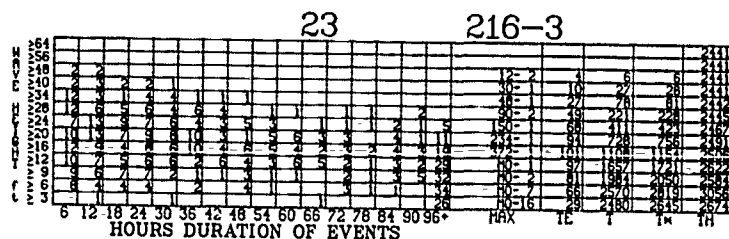
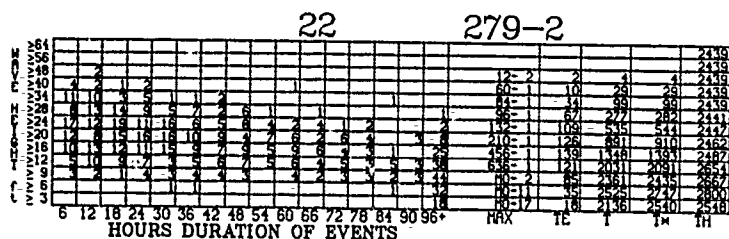
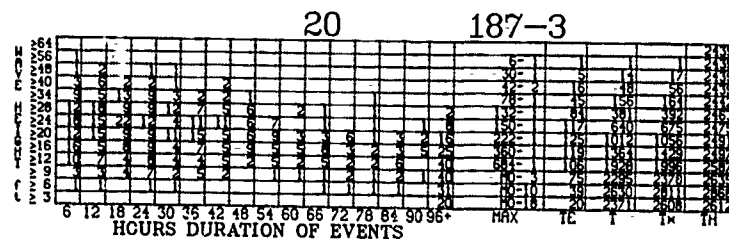
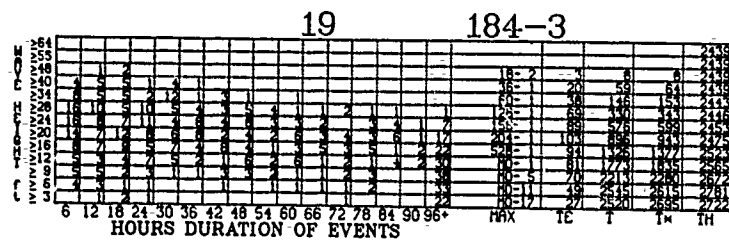
18 171-3



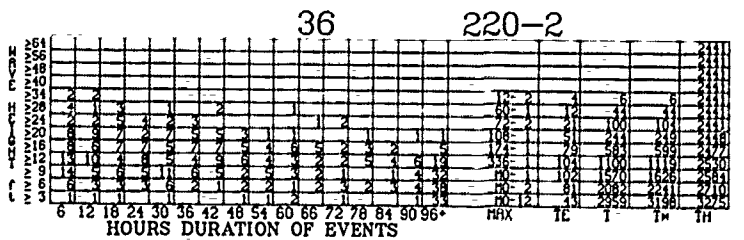
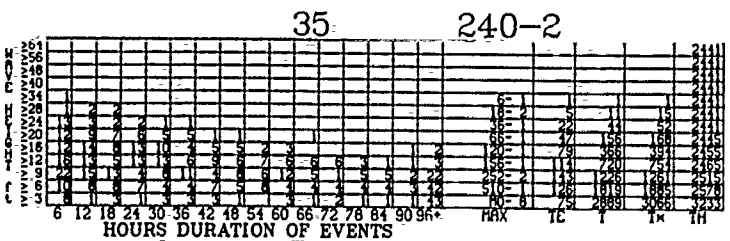
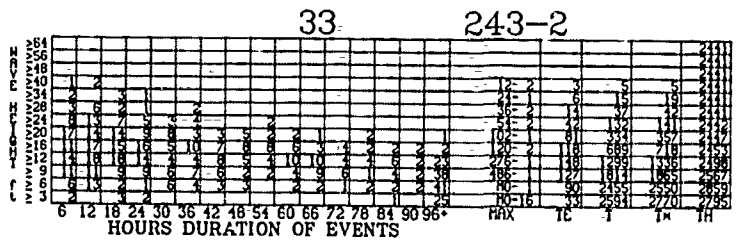
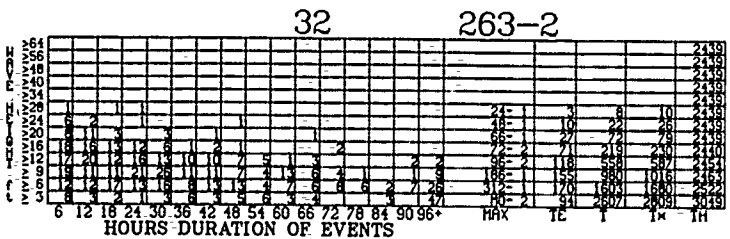
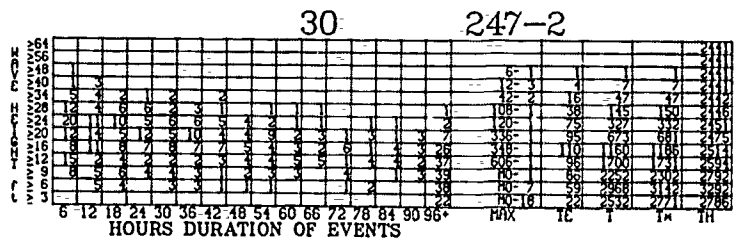
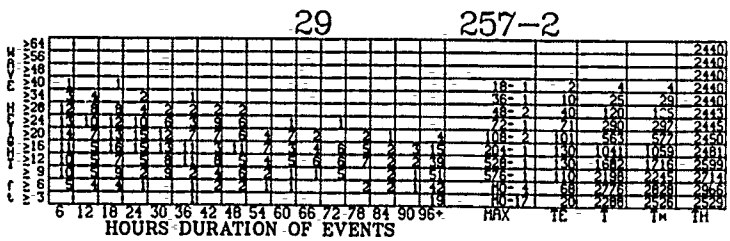
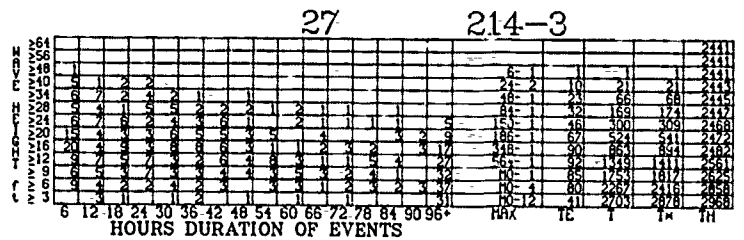
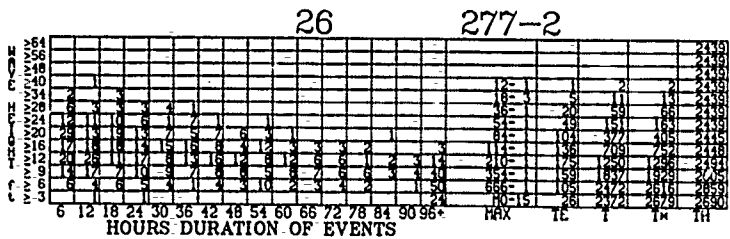
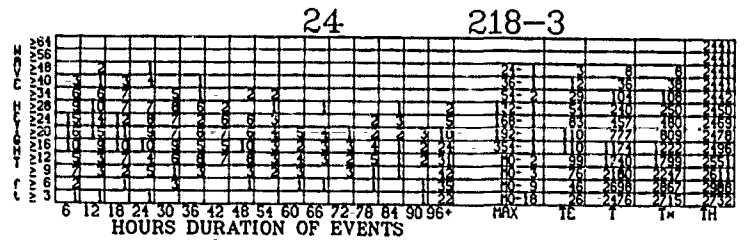
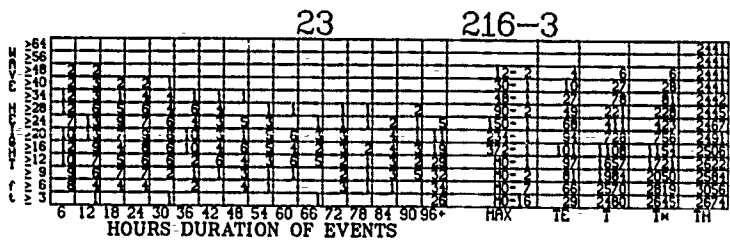
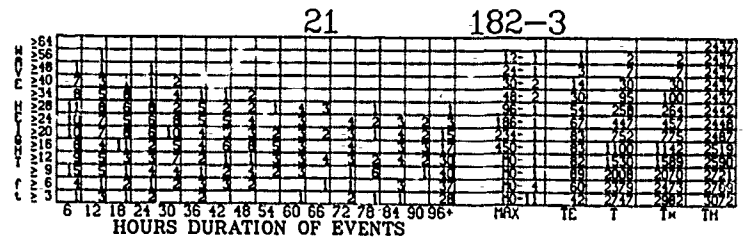
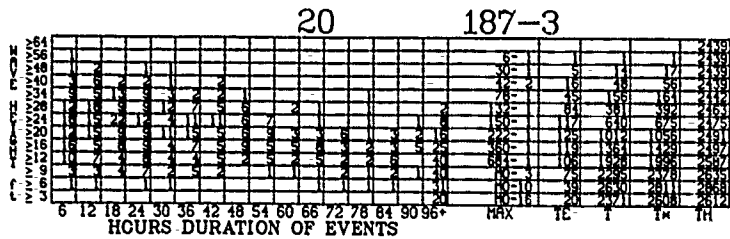


# JANUARY

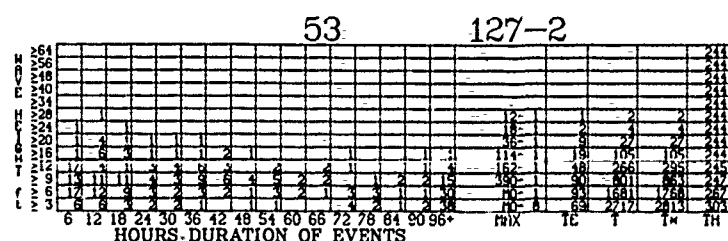
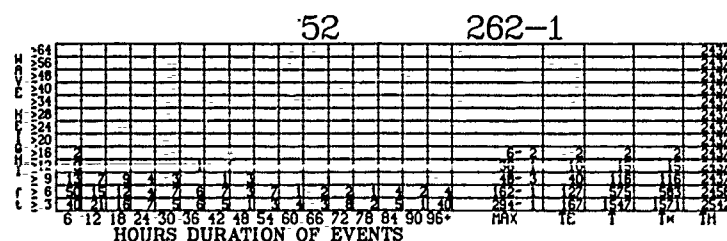
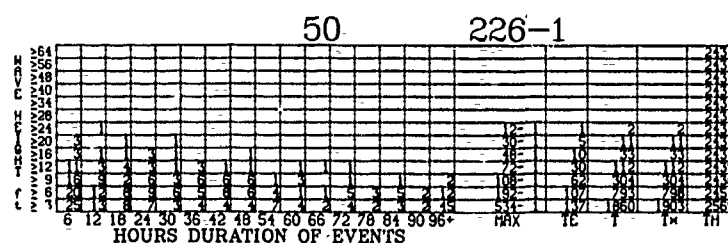
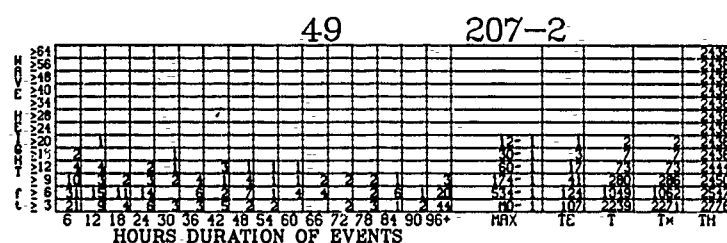
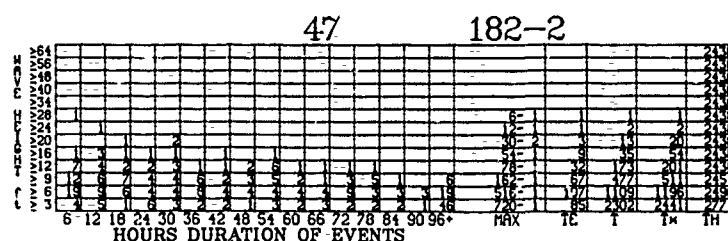
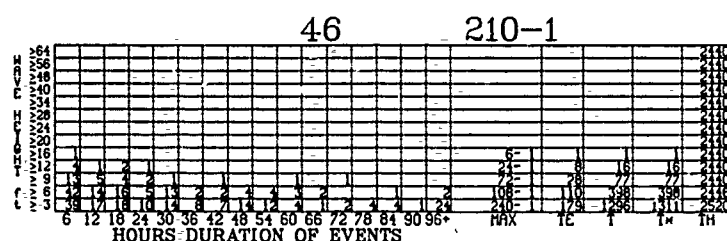
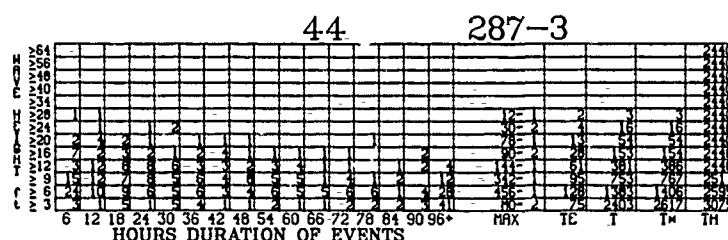
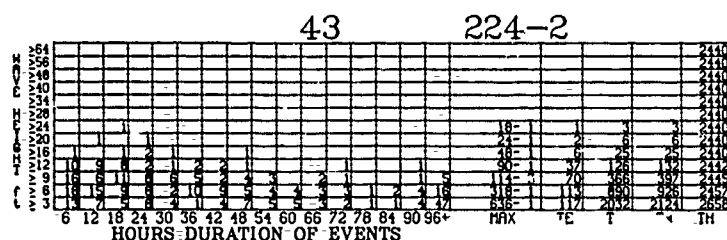
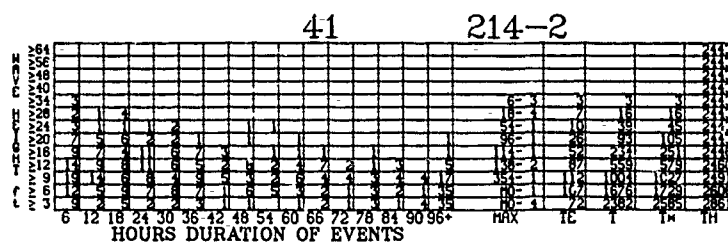
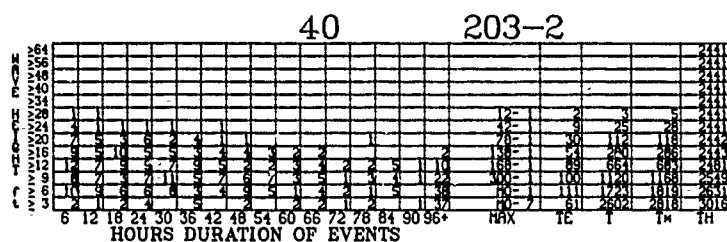
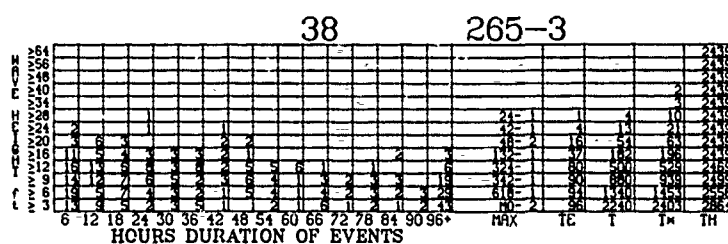
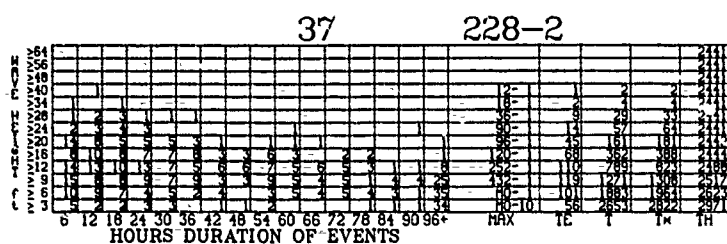
WAV



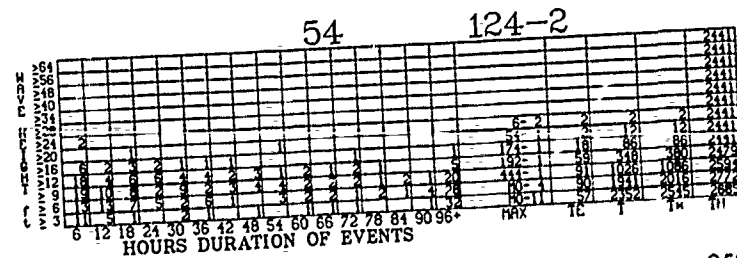
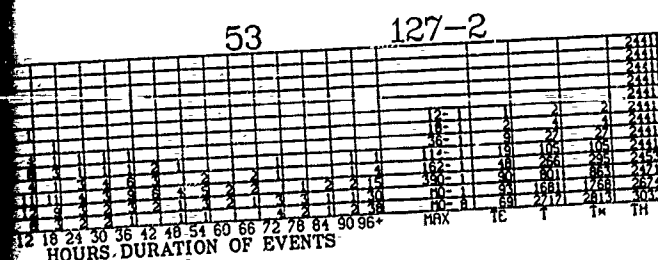
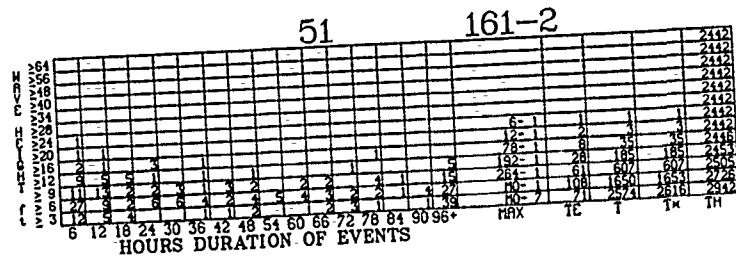
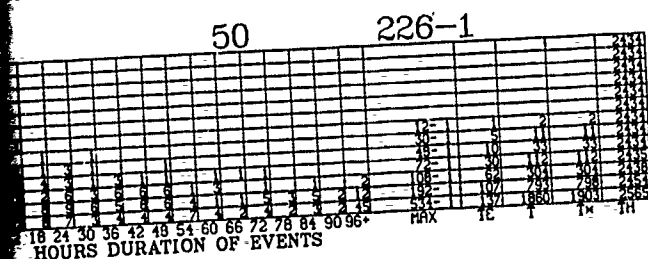
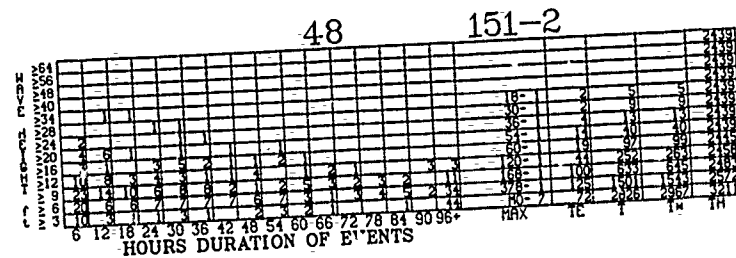
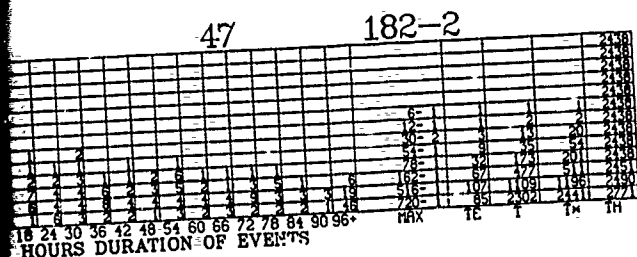
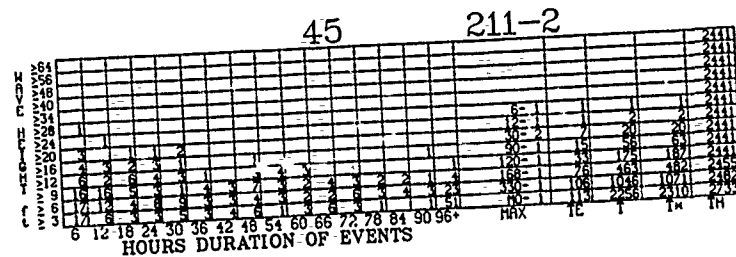
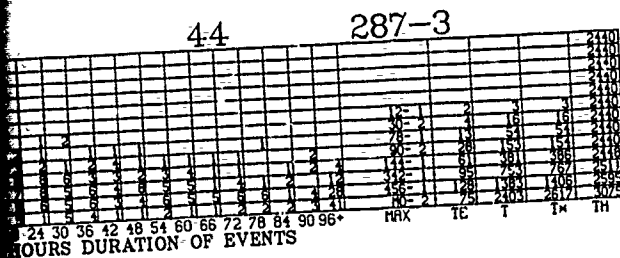
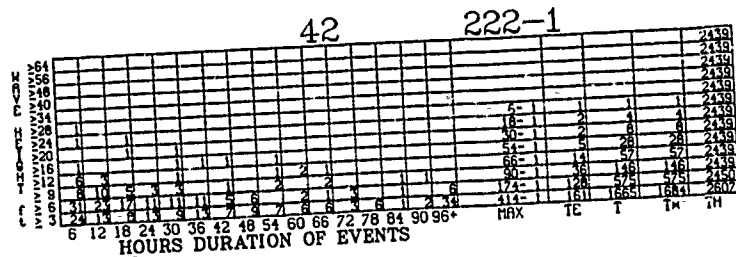
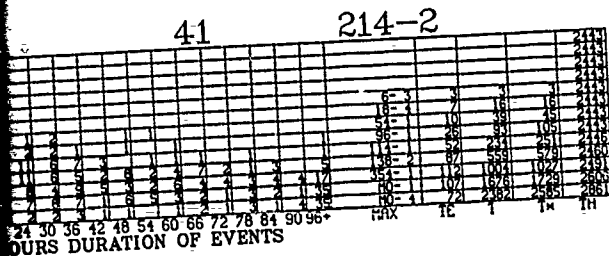
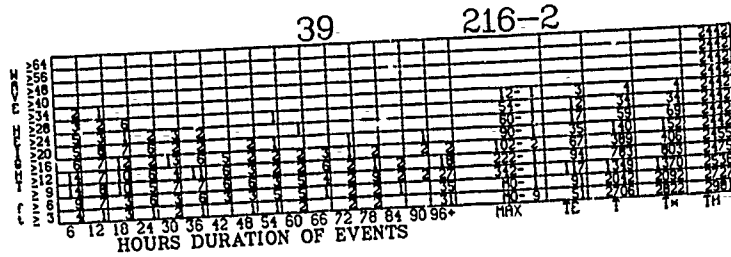
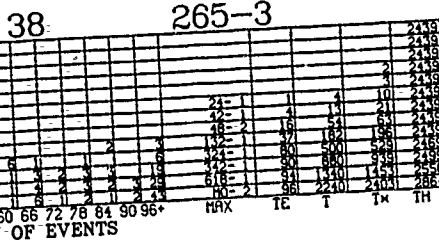
# WAVE HEIGHT DURATIONS (Cont'd)



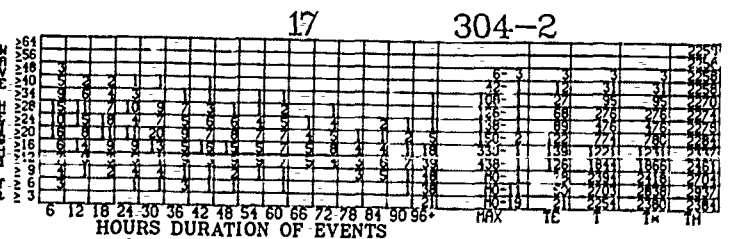
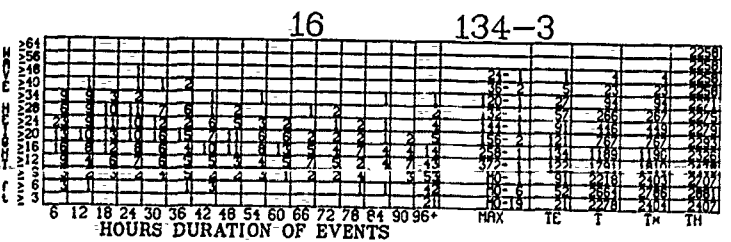
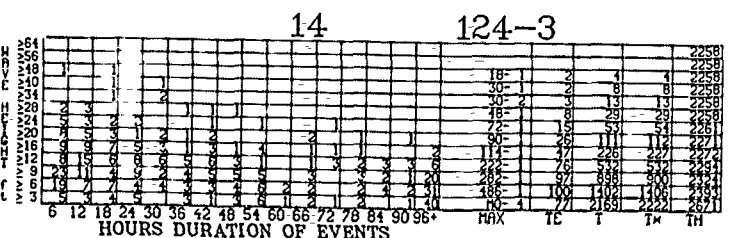
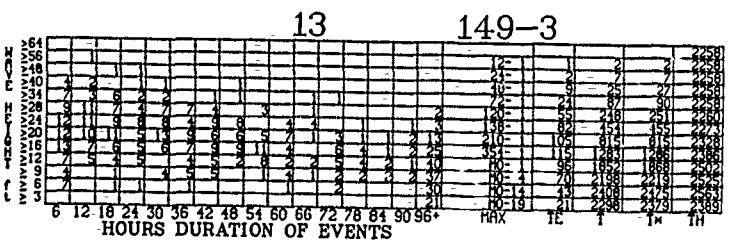
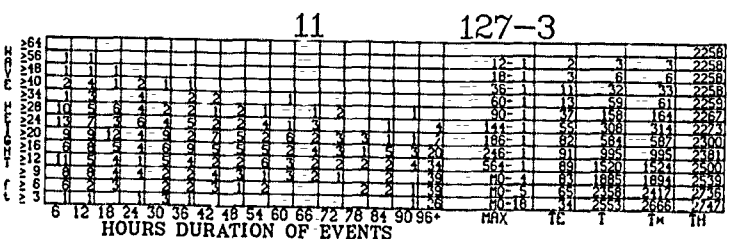
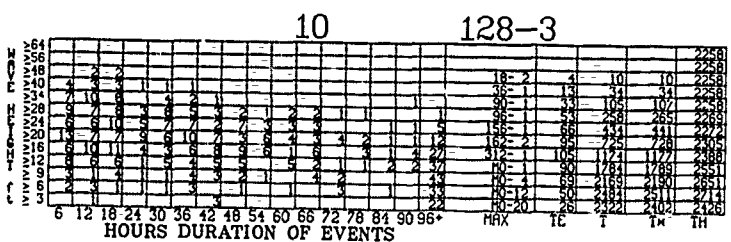
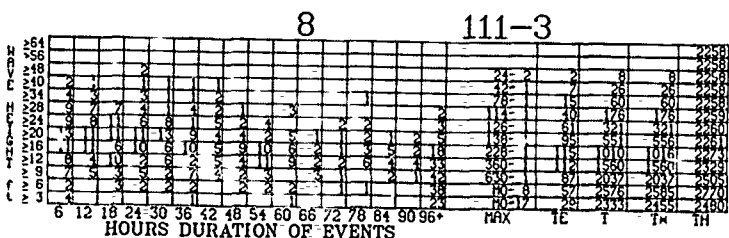
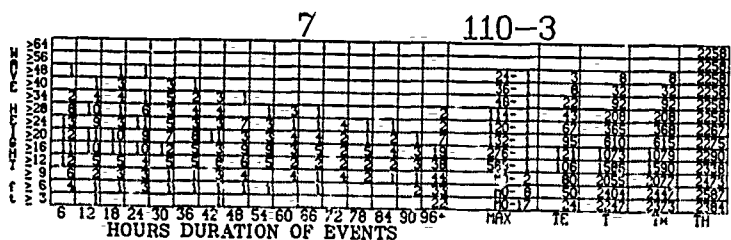
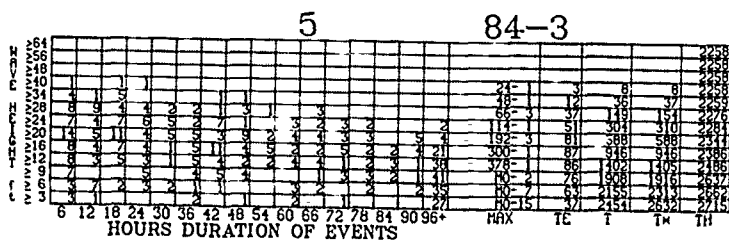
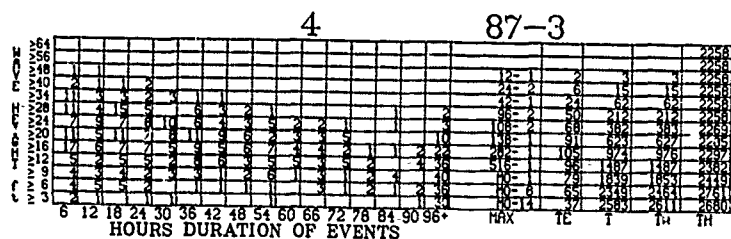
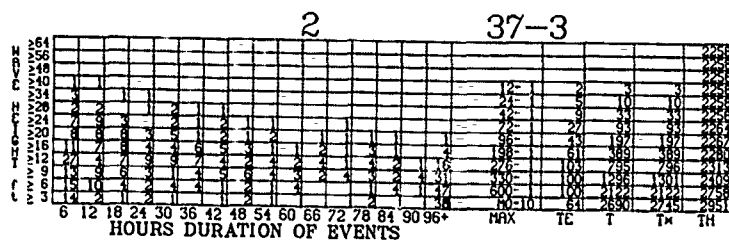
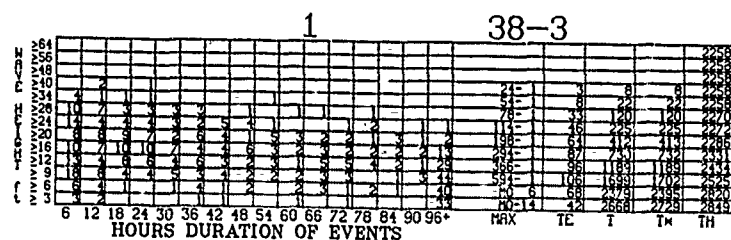
# WAVE HEIGHT DURATIONS (Cont'd)



# JANUARY



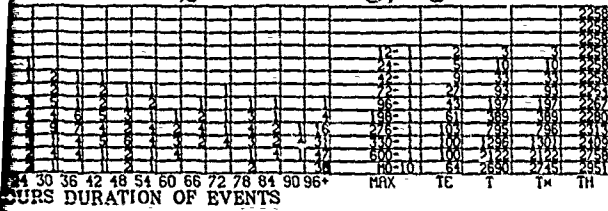
# FEBRUARY



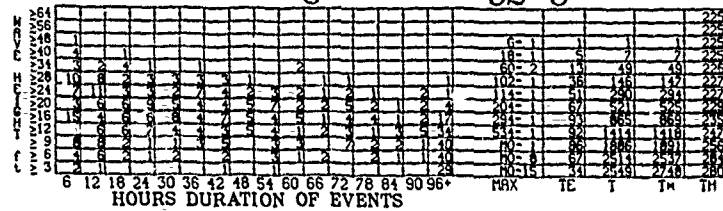


# WAVE HEIGHT DURATIONS

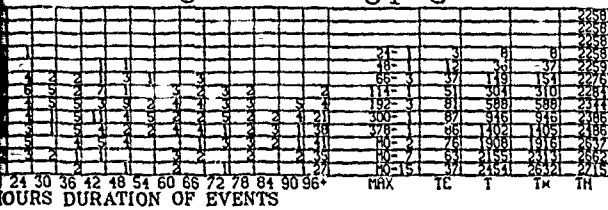
2 37-3



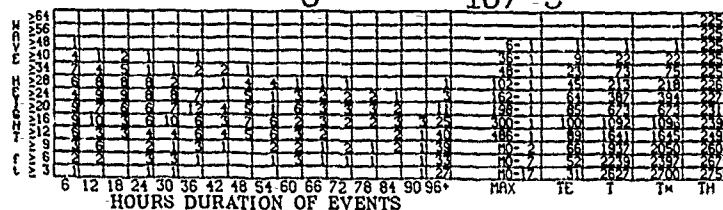
3 62-3



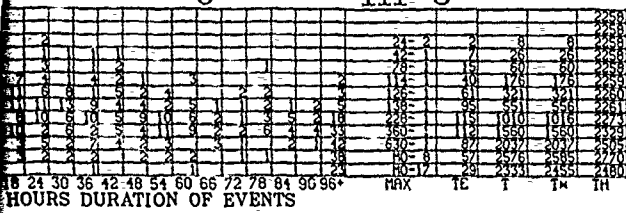
5 84-3



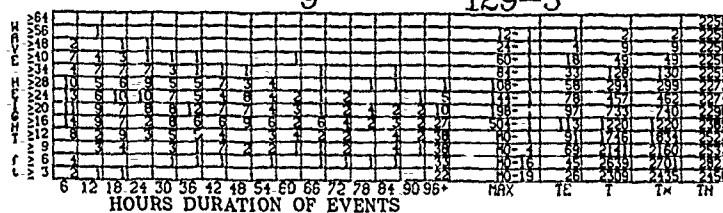
6 107-3



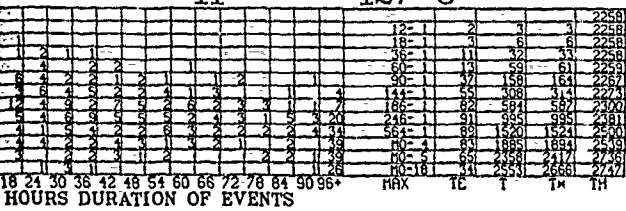
8 111-3



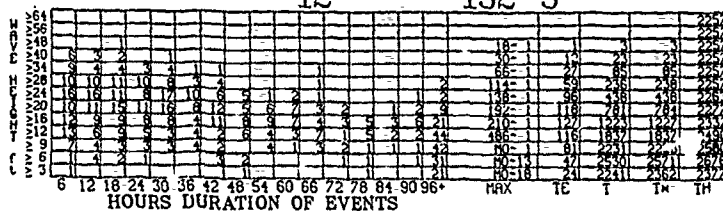
9 129-3



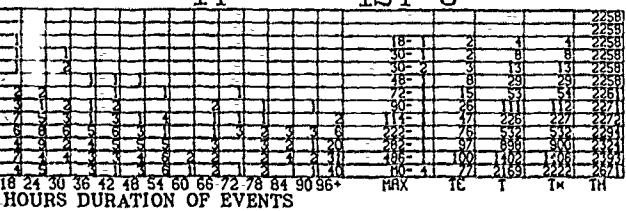
11 127-3



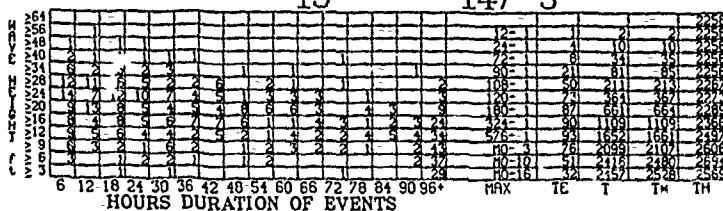
12 132-3



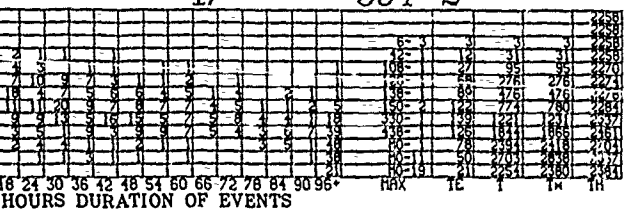
14 124-3



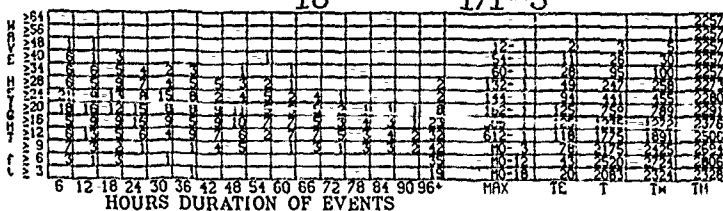
15 147-3



17 304-2

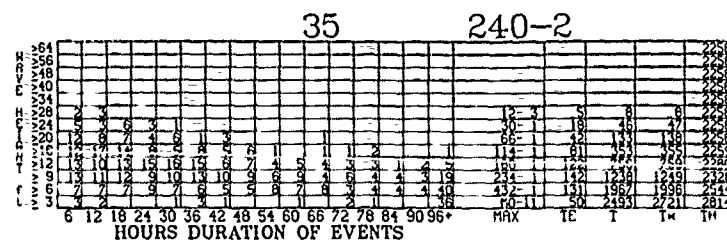
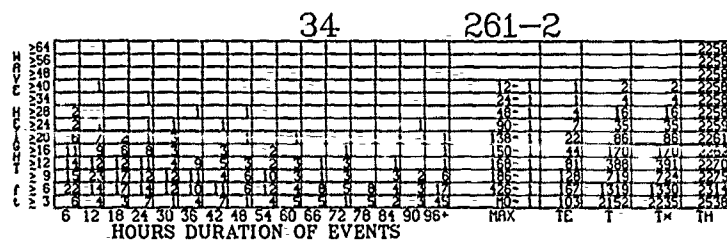
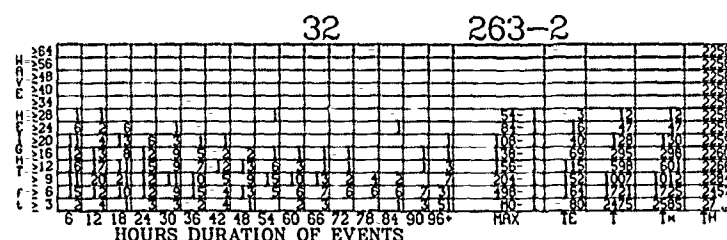
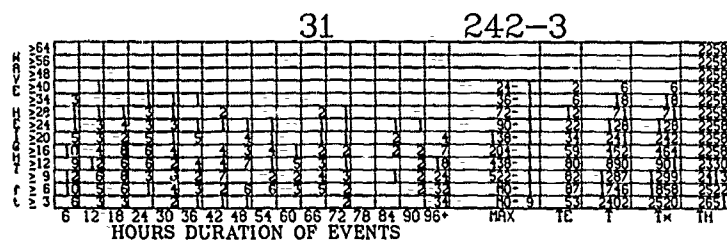
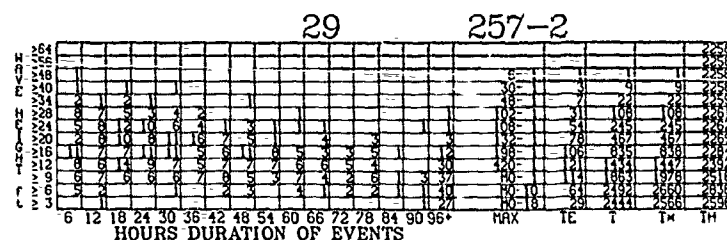
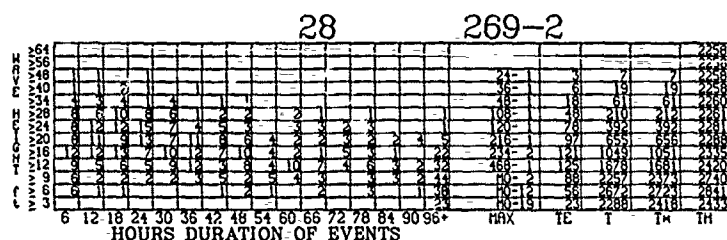
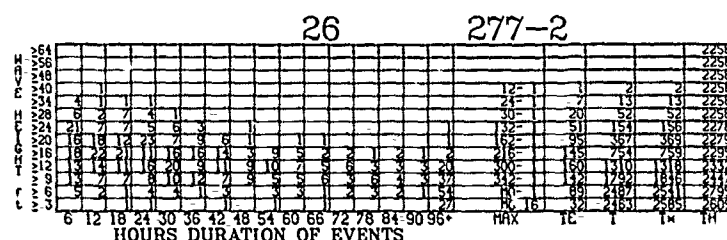
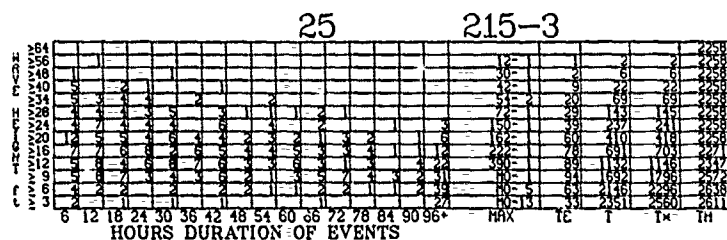
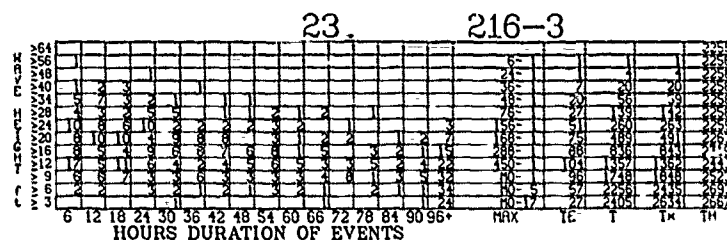
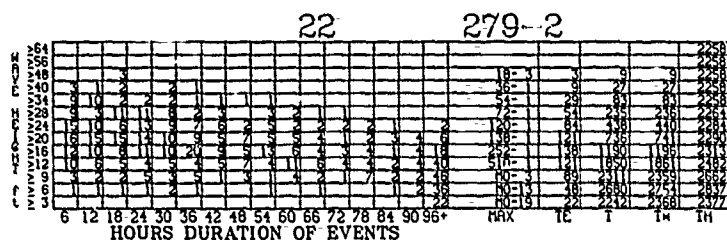
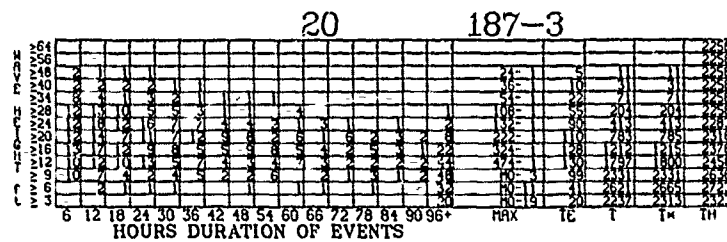
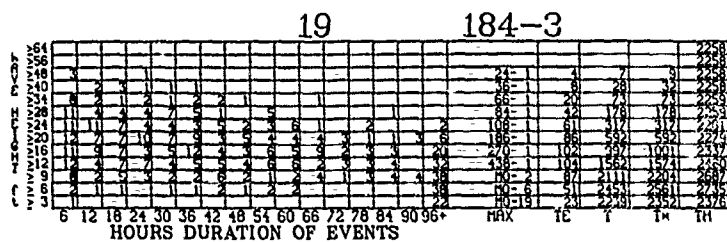


18 171-3



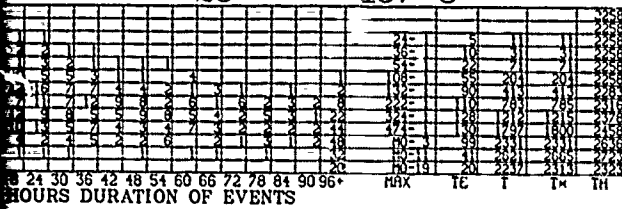


# WAVE HEIGHT DURATIONS (Cont'd)

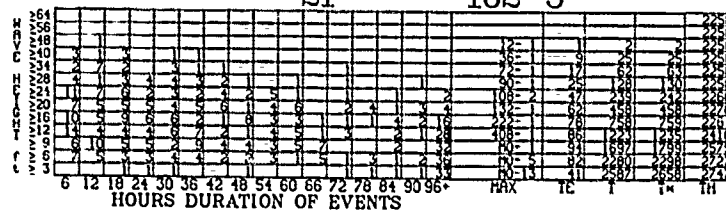


# FEBRUARY

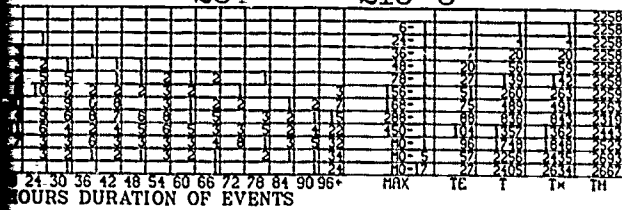
20 187-3



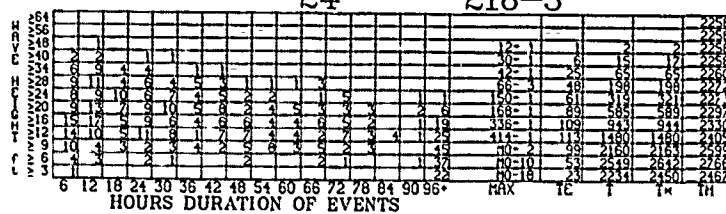
21 182-3



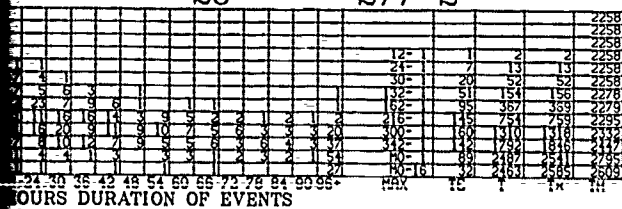
23 216-3



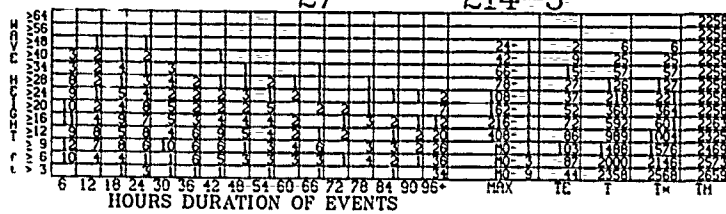
24 218-3



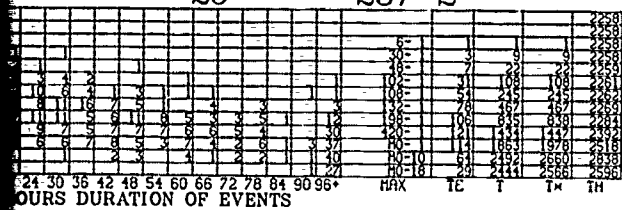
26 277-2



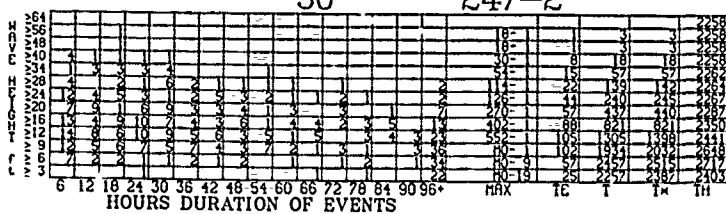
27 214-3



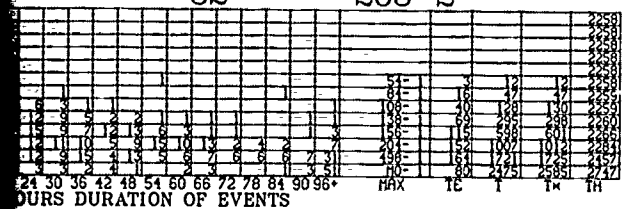
29 257-2



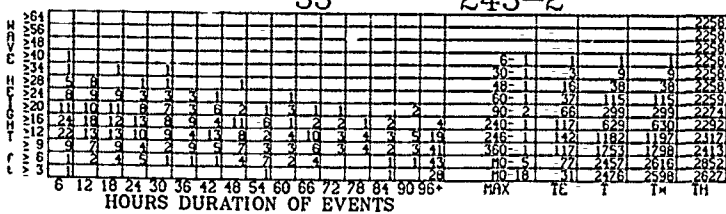
30 247-2



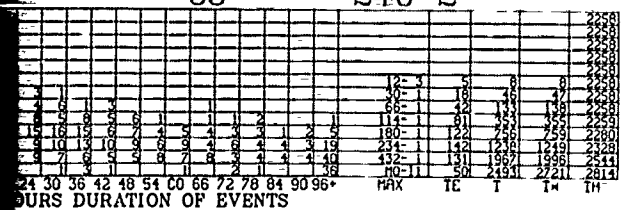
32 263-2



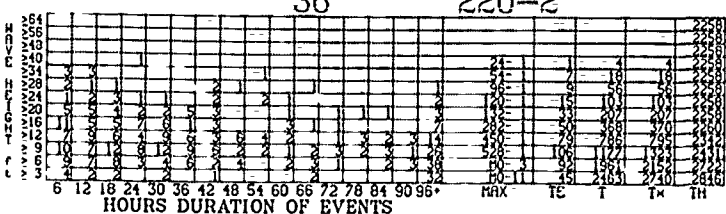
33 243-2



35 240-2

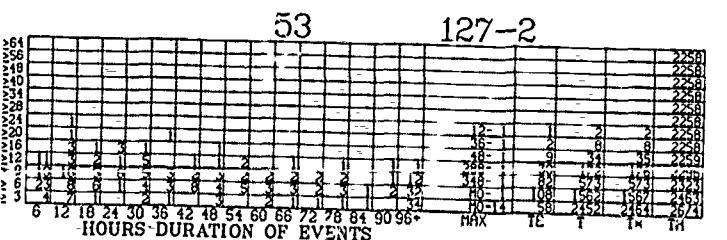
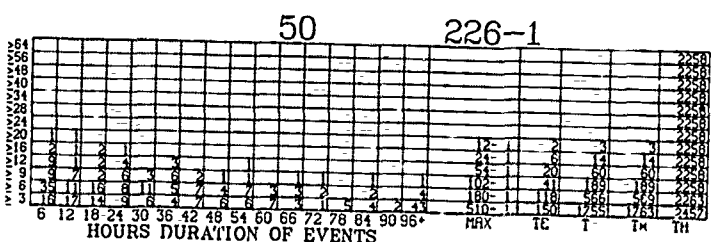
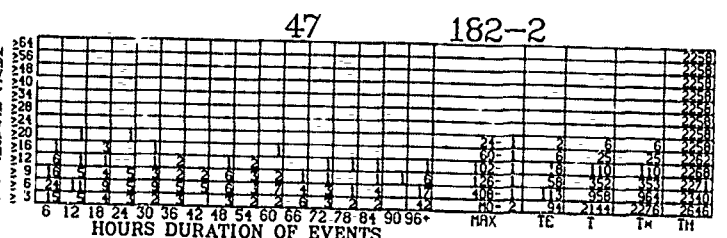
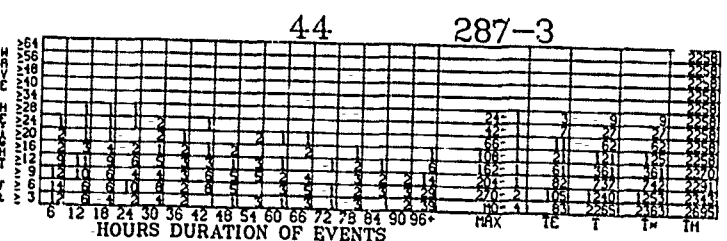
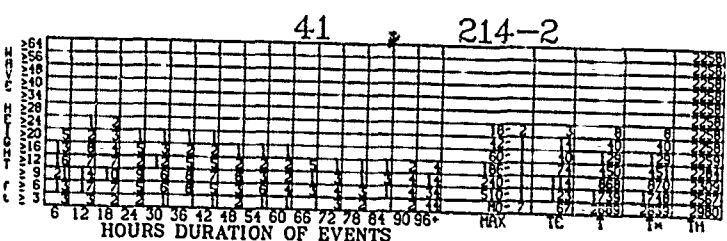
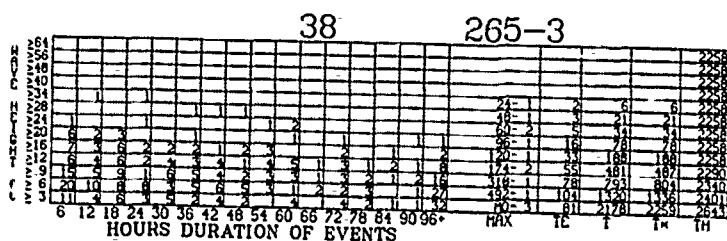
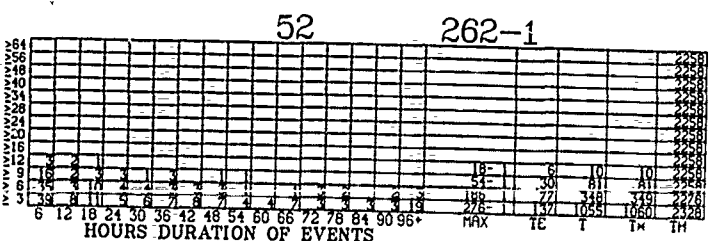
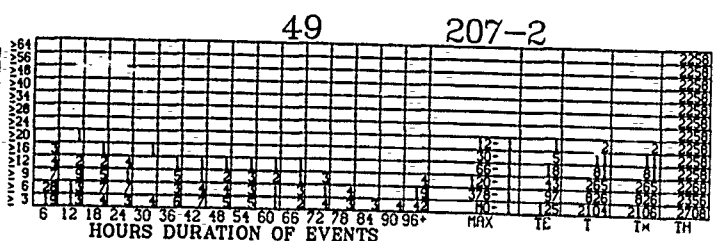
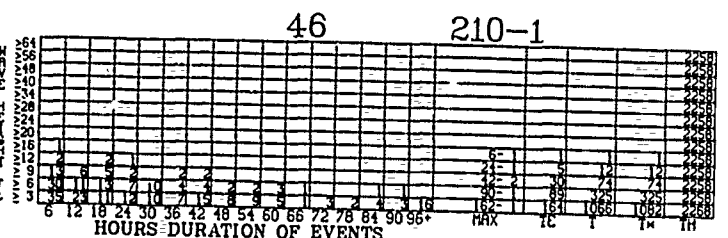
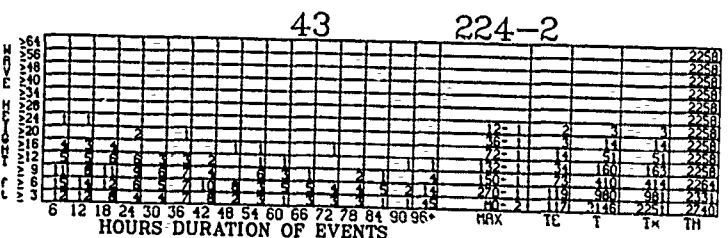
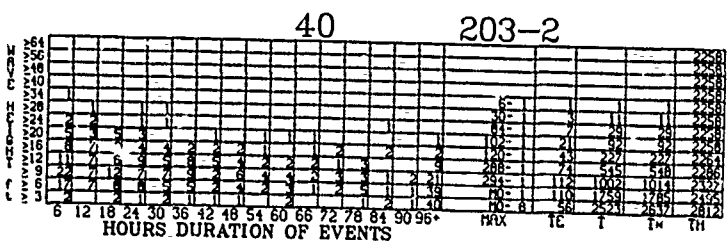
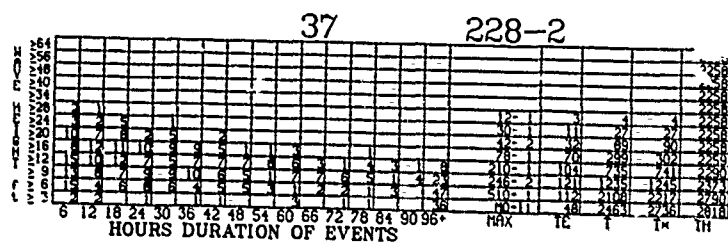


36 220-2



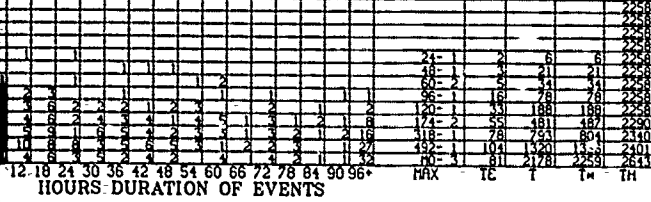
# FEBRUARY

# WAVE

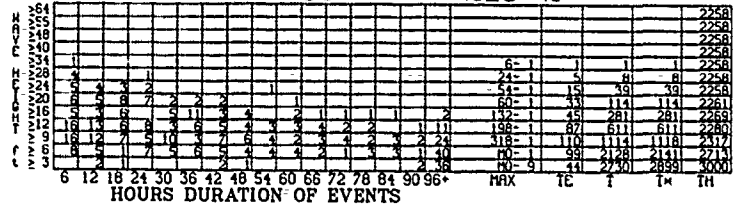


# WAVE HEIGHT DURATIONS (Cont'd)

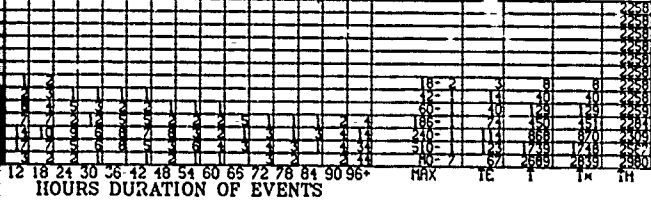
38 265-3



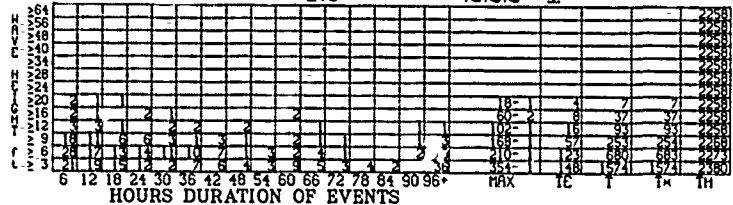
39 216-2



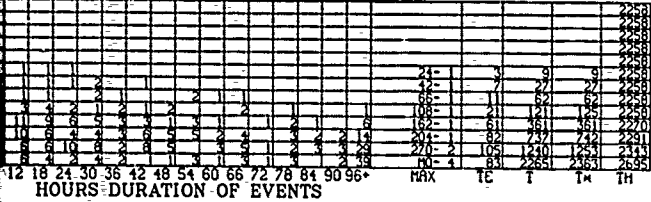
41 214-2



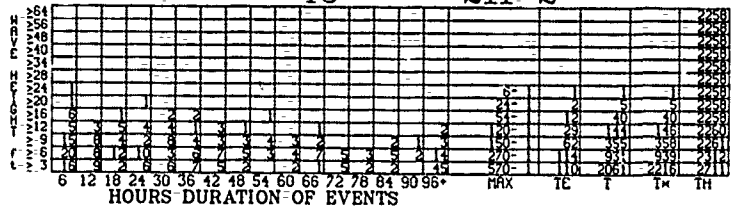
42 222-1



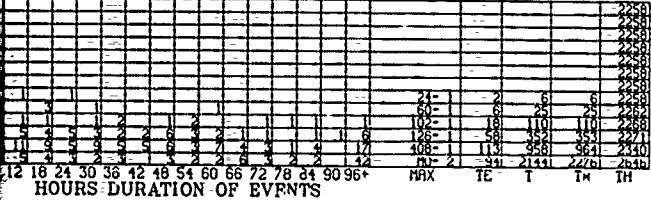
44 287-3



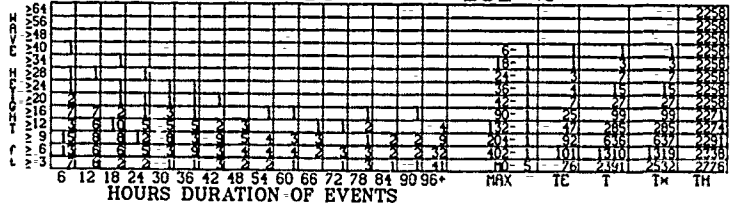
45 211-2



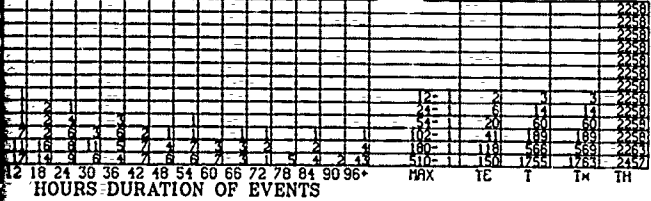
47 182-2



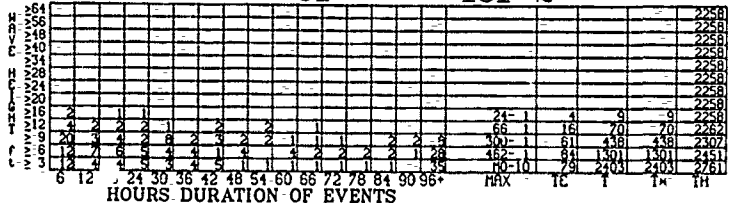
48 151-2



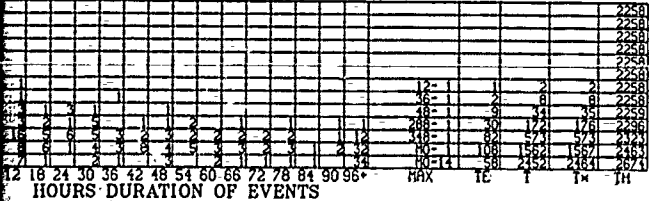
50 226-1



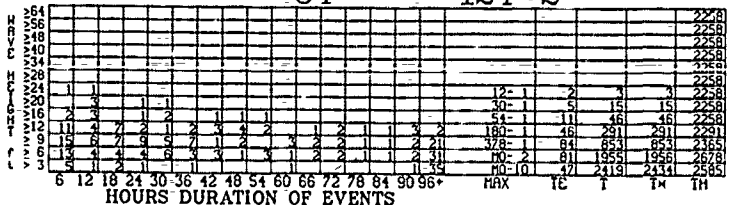
51 161-2



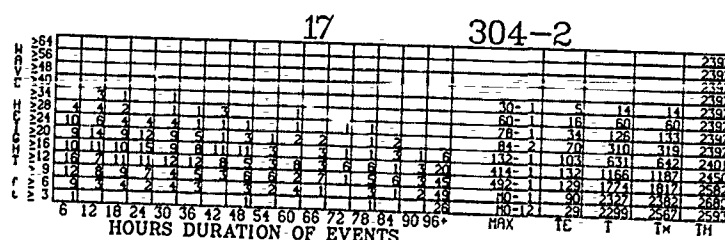
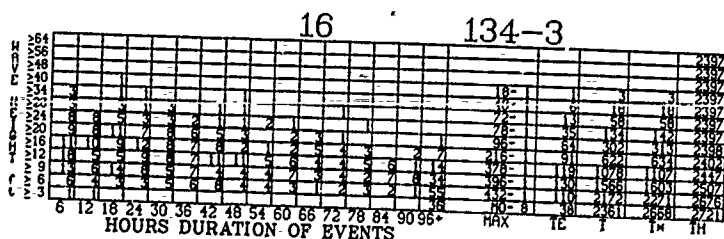
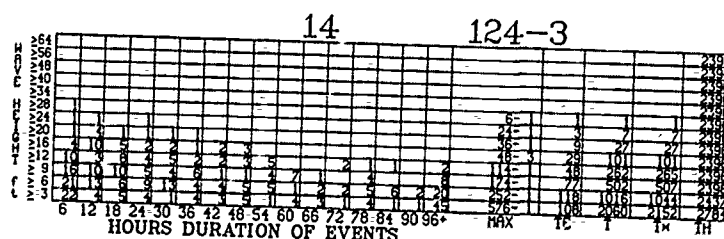
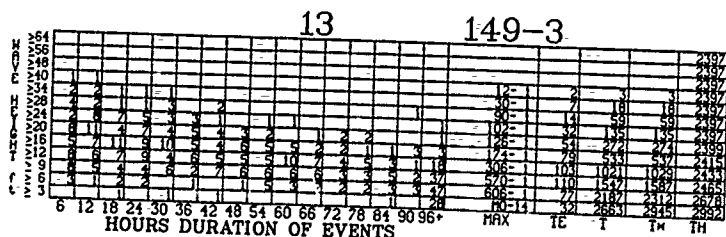
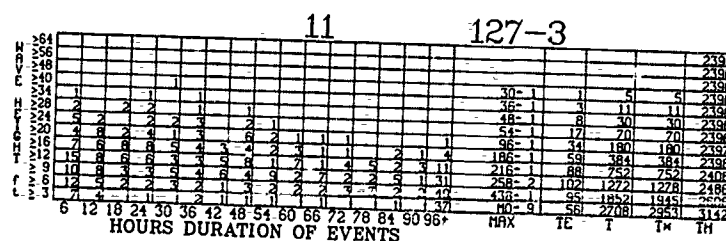
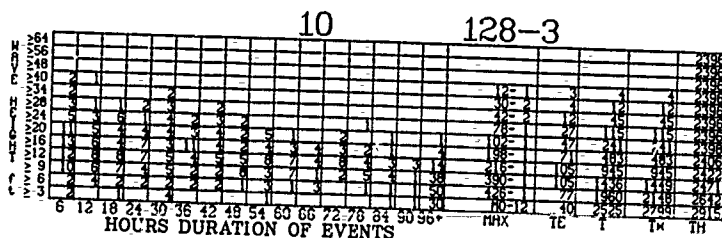
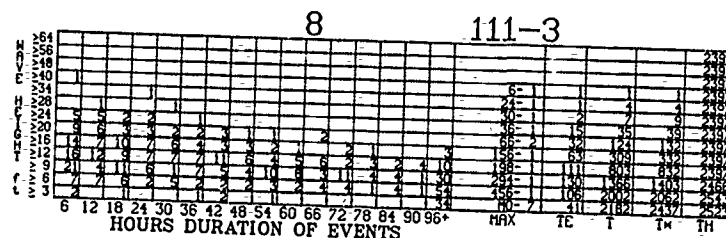
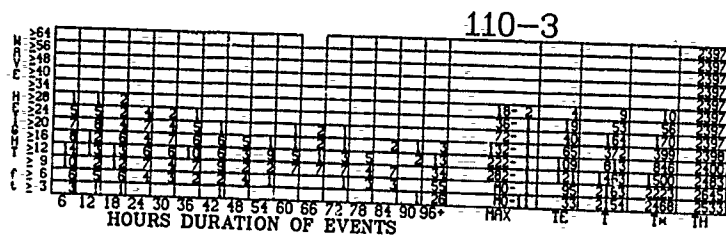
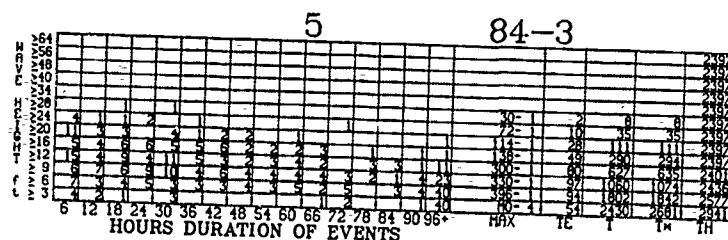
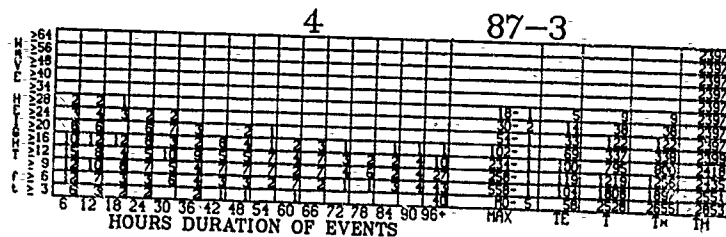
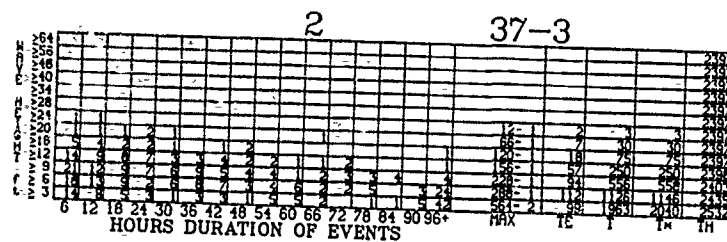
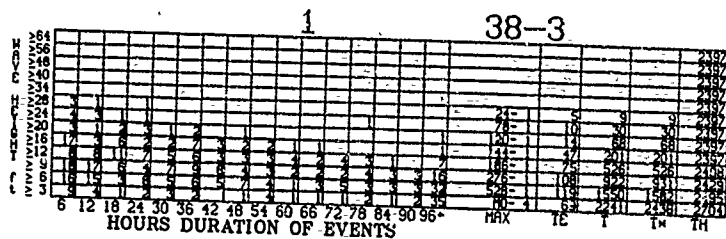
53 127-2



54 124-2



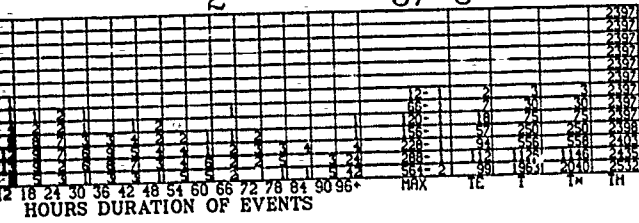
# WAVE HEIGHT DURATIONS



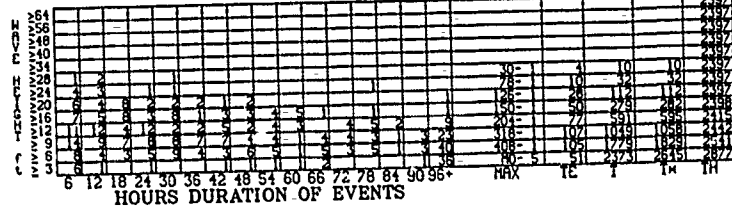


# APRIL

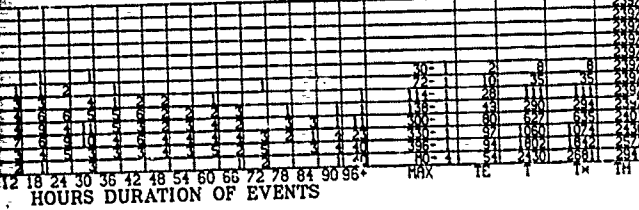
2 37-3



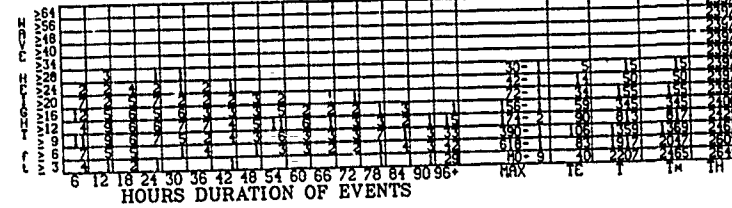
3 62-3



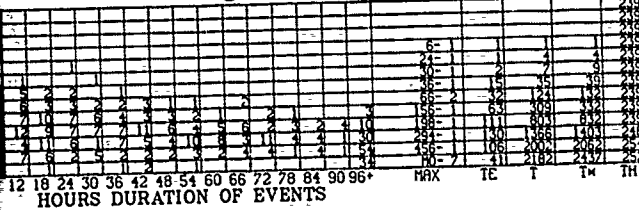
5 84-3



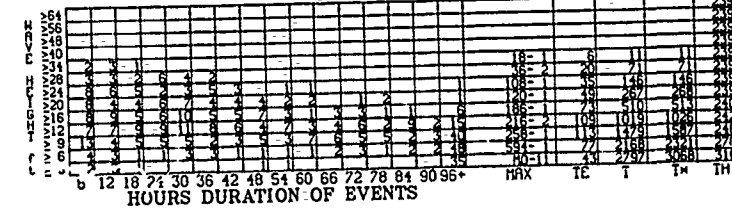
6 107-3



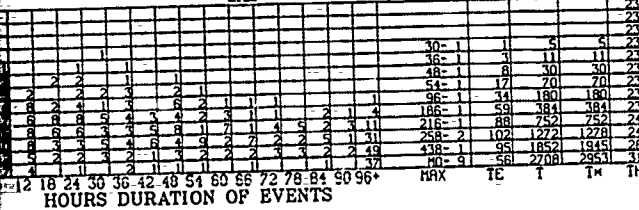
8 111-3



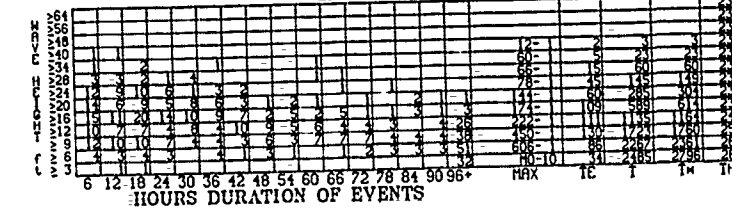
9 129-3



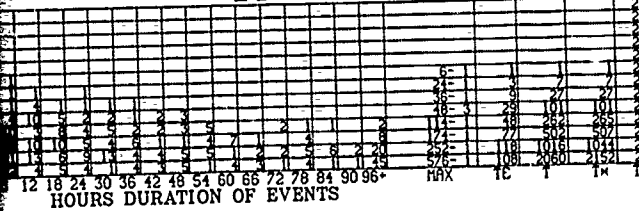
11 127-3



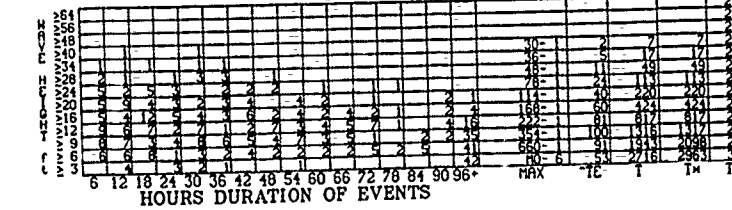
12 132-3



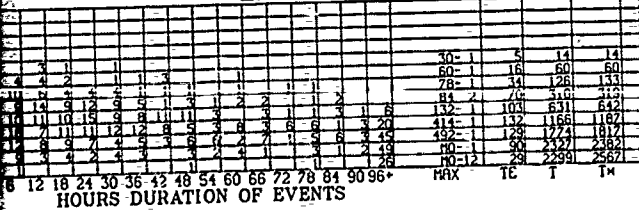
14 124-3



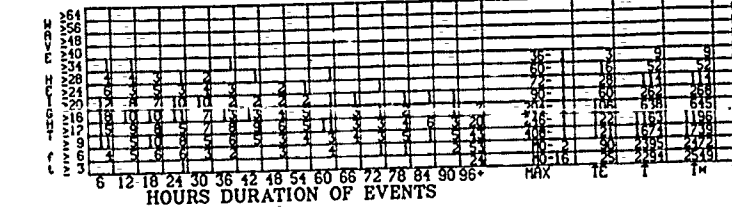
15 147-3



17 304-2



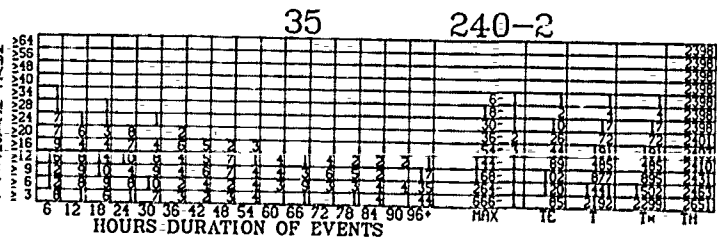
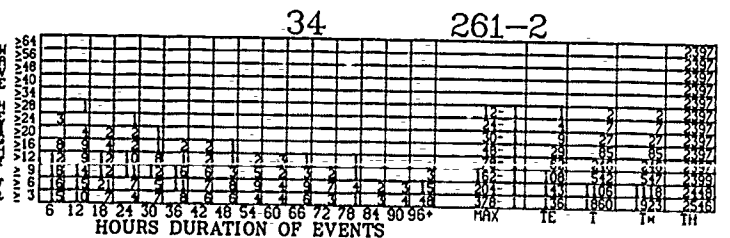
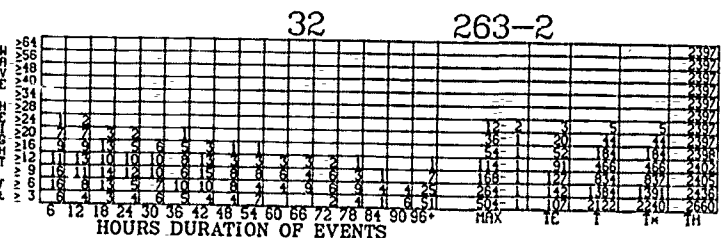
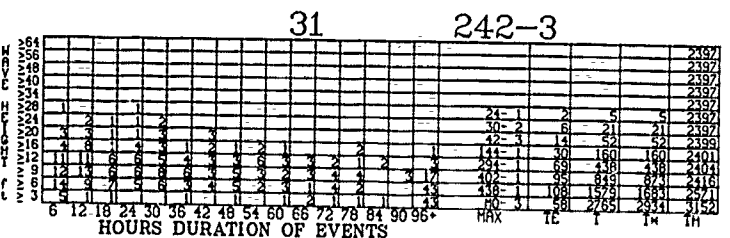
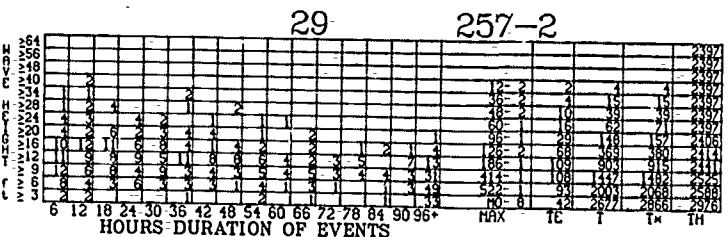
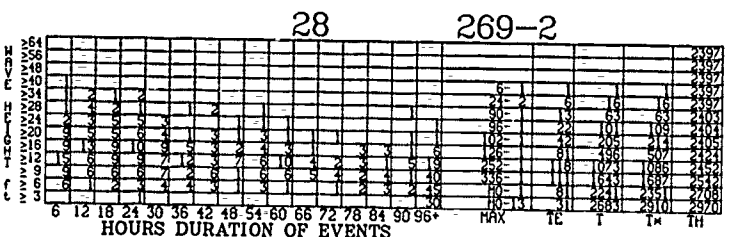
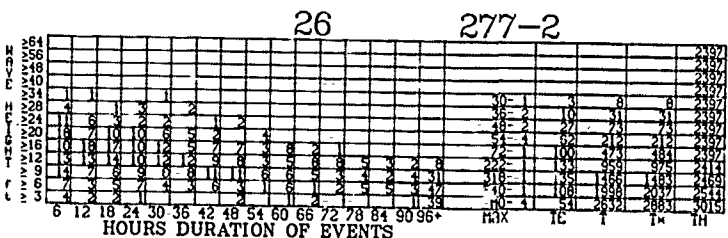
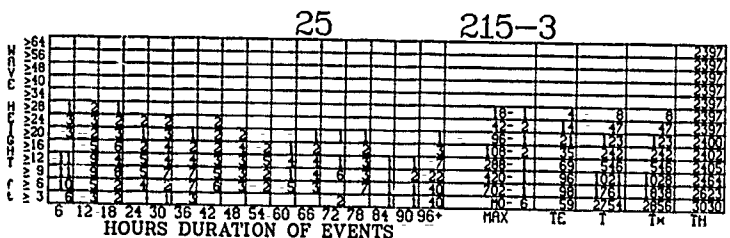
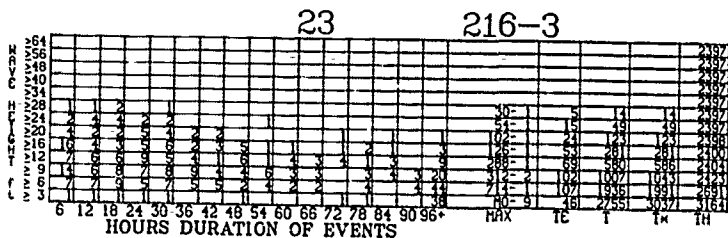
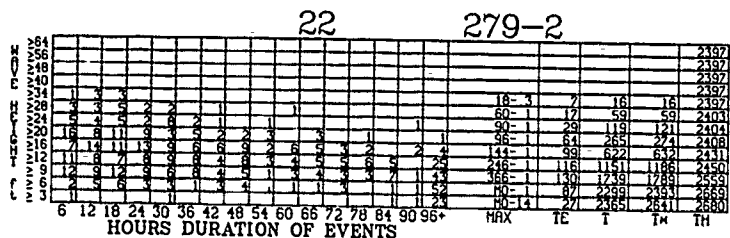
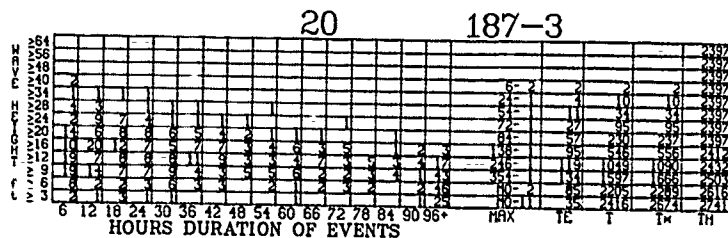
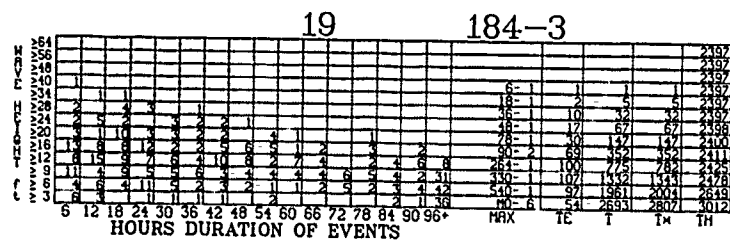
18 171-3



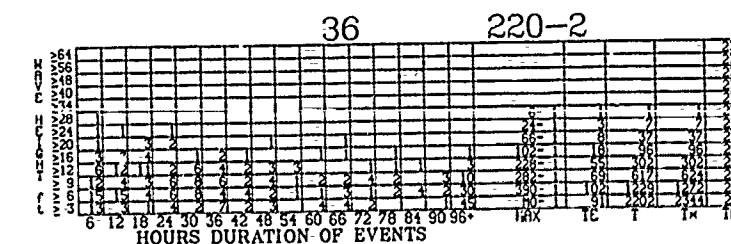
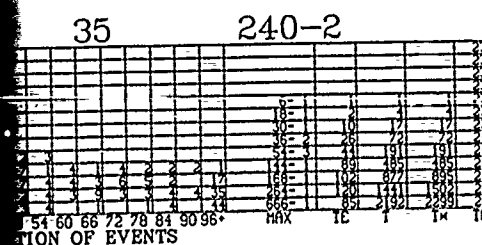
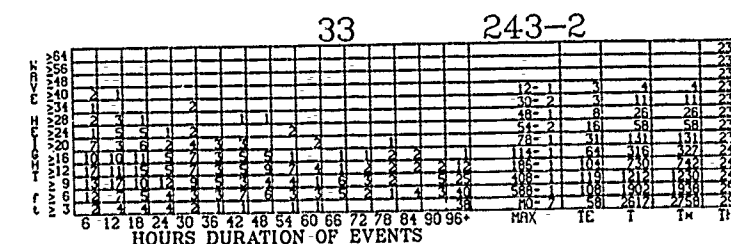
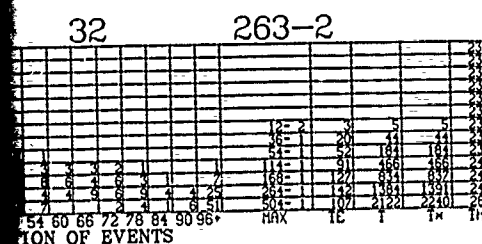
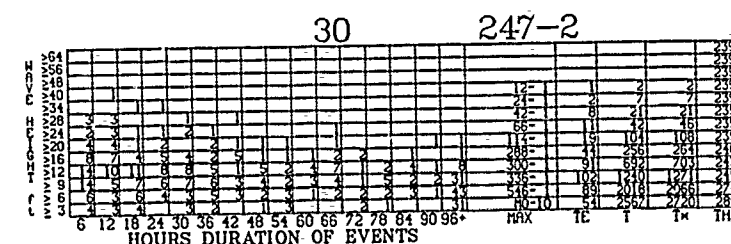
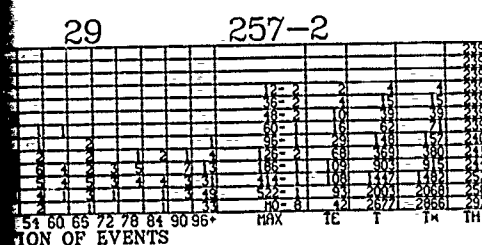
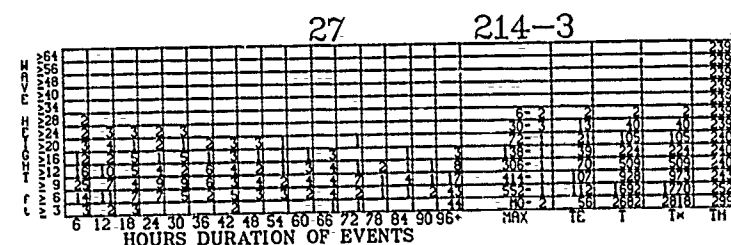
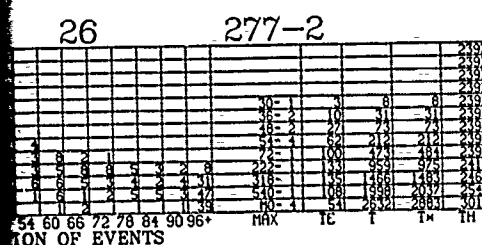
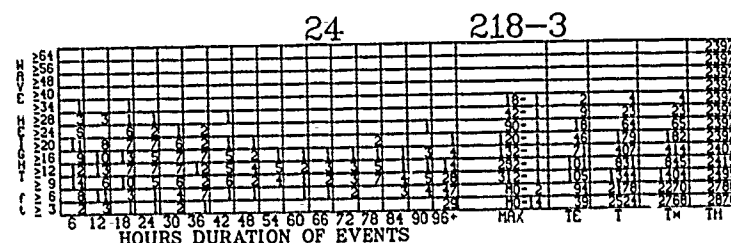
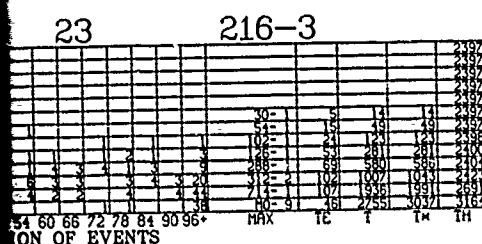
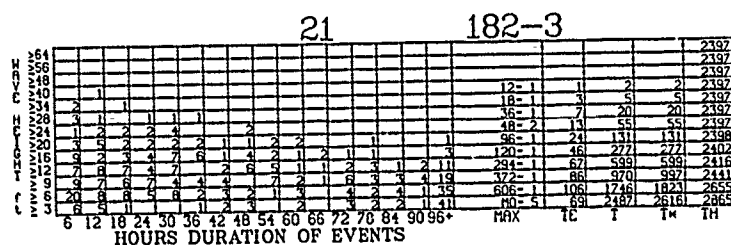
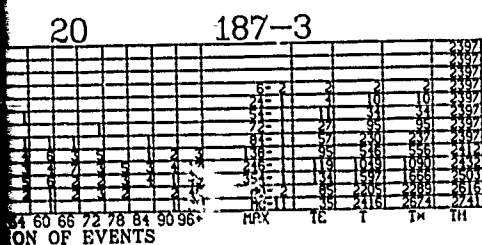


# APRIL

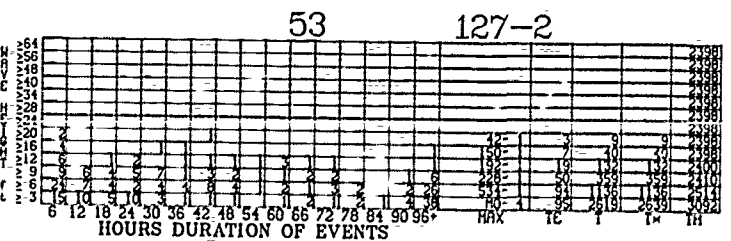
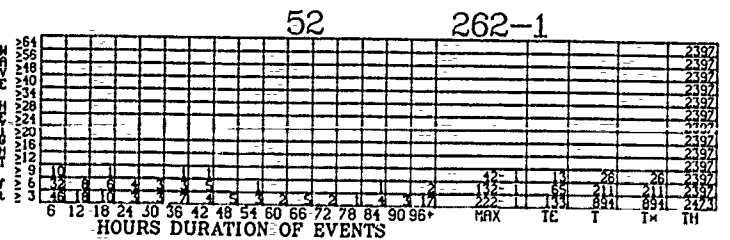
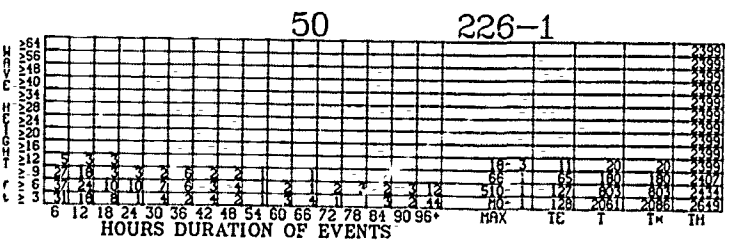
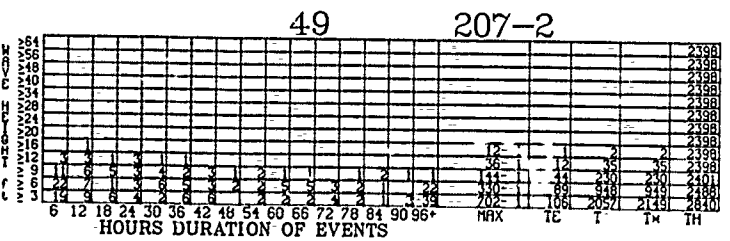
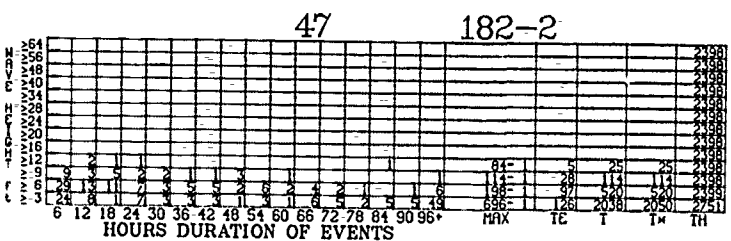
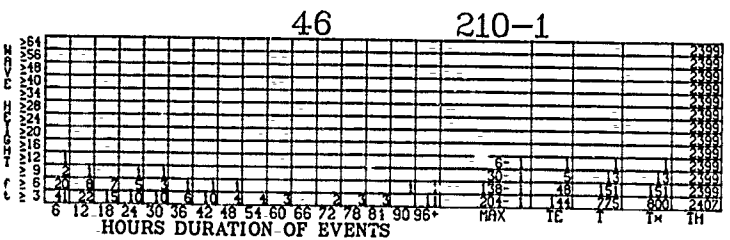
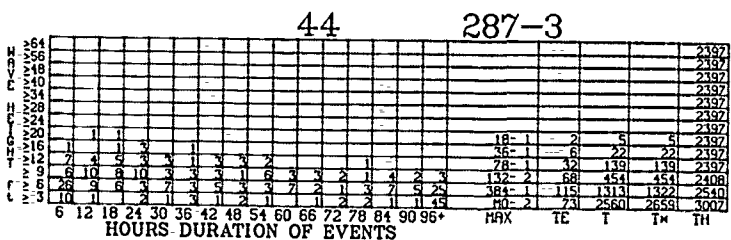
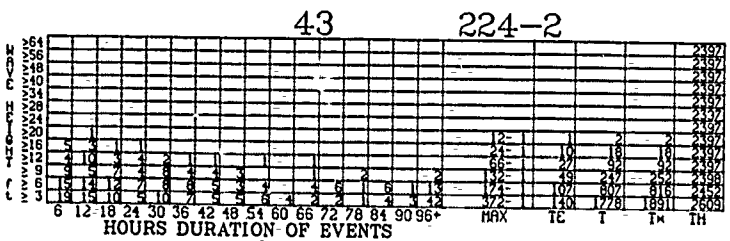
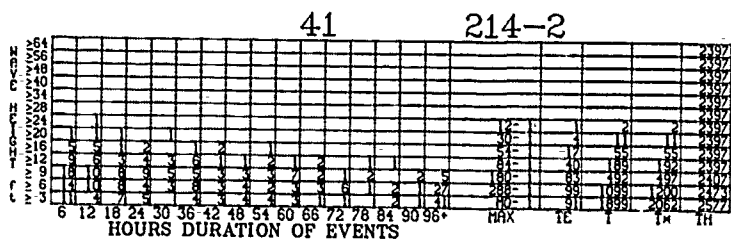
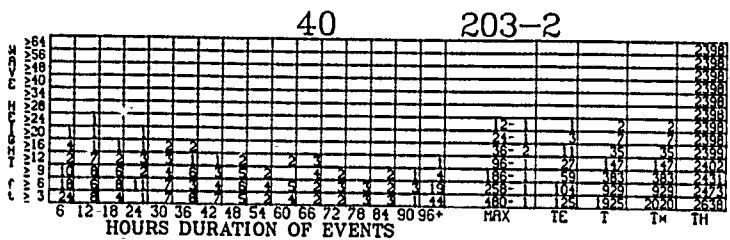
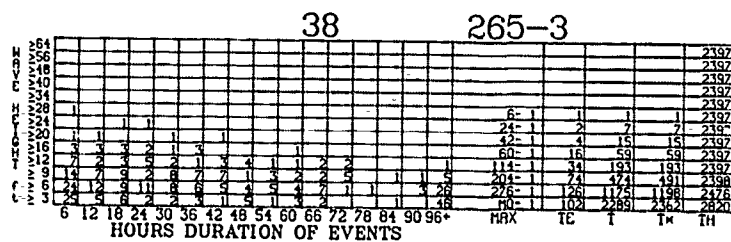
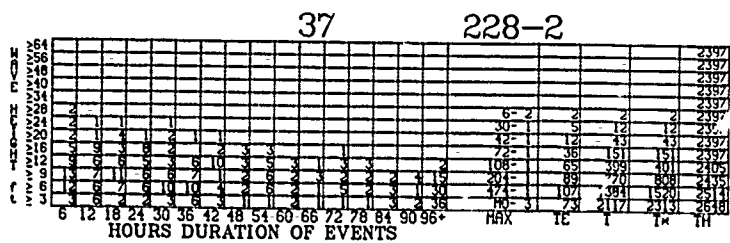
# WAVE



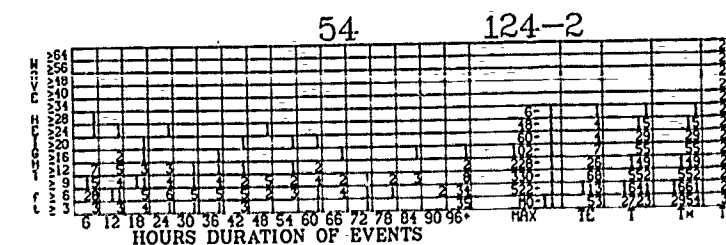
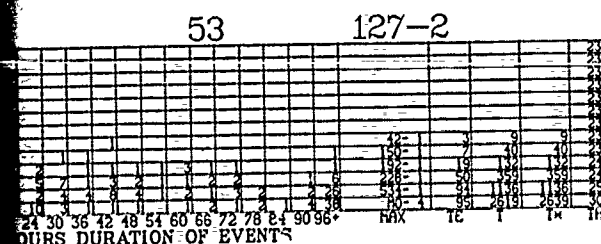
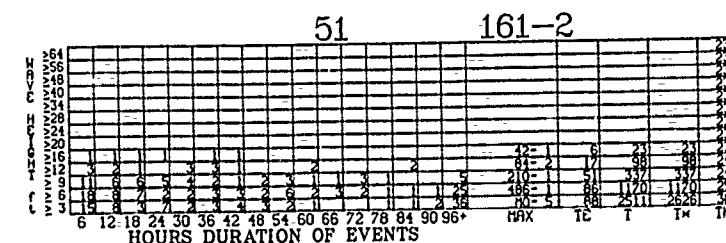
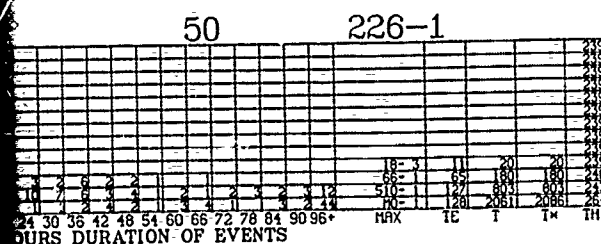
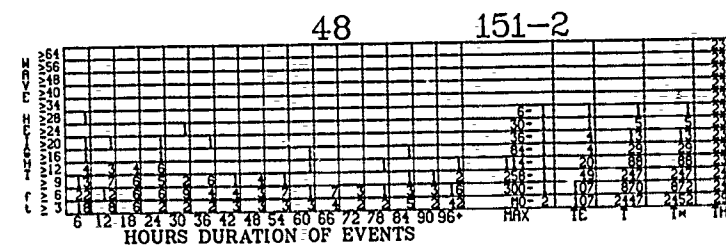
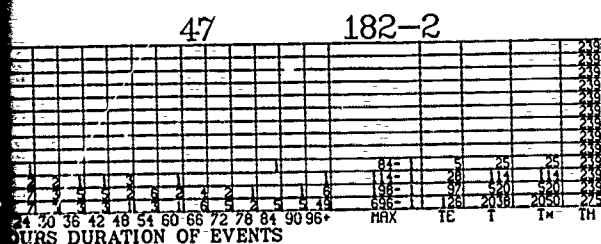
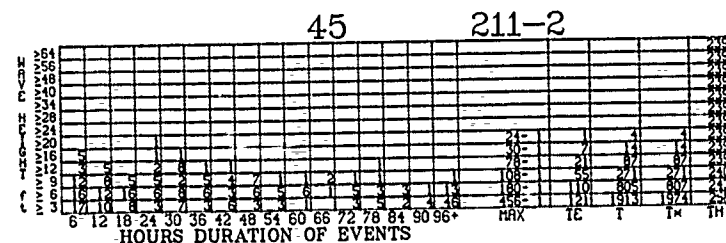
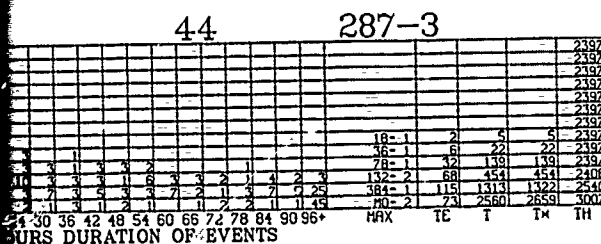
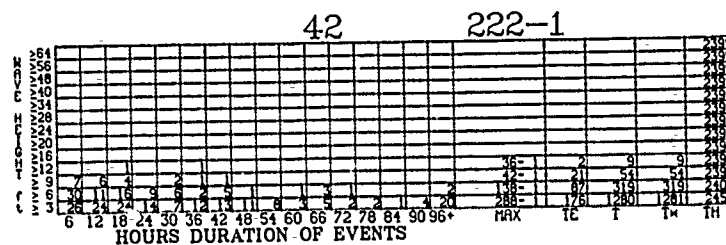
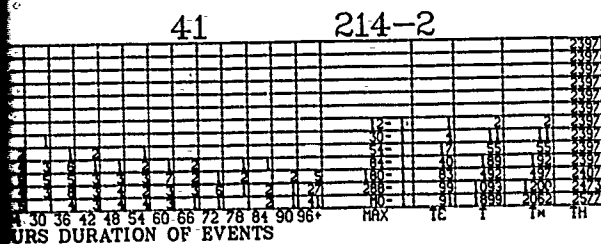
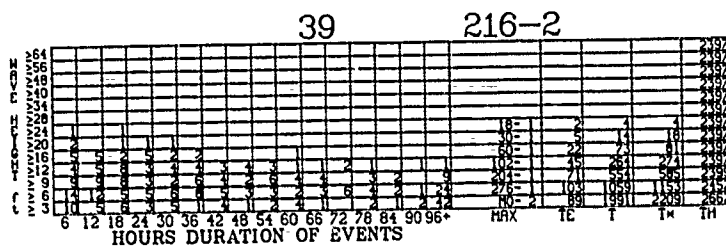
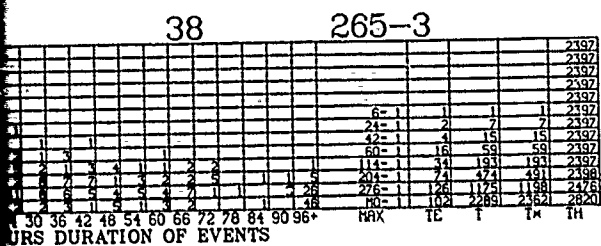
# WAVE HEIGHT DURATIONS (Cont'd)



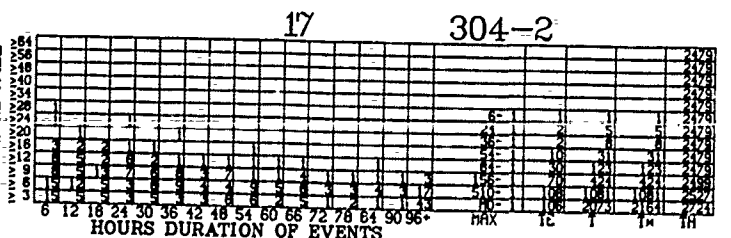
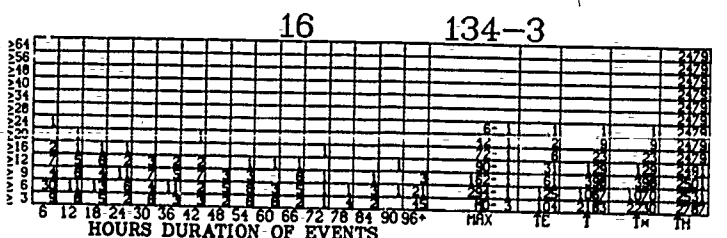
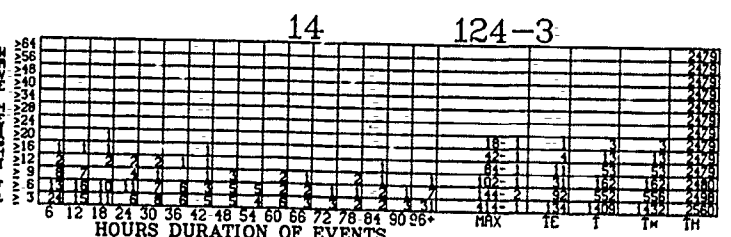
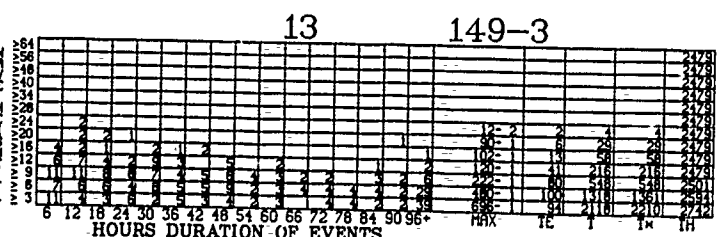
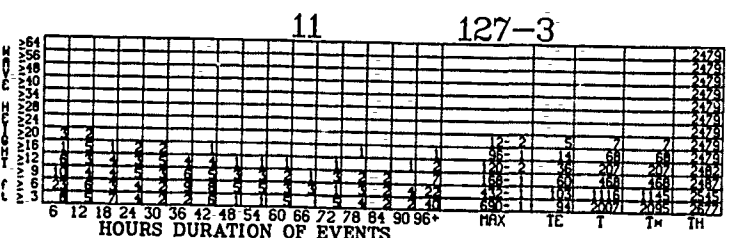
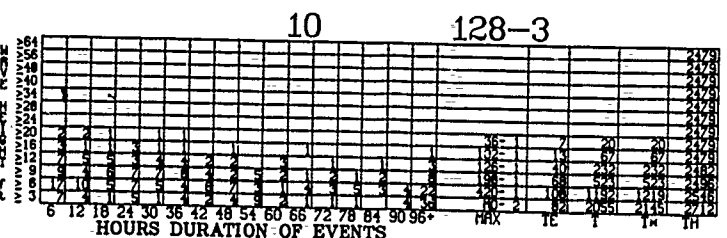
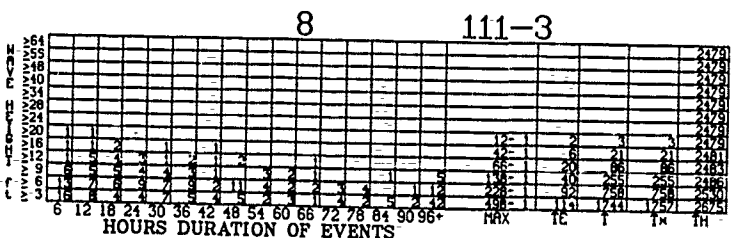
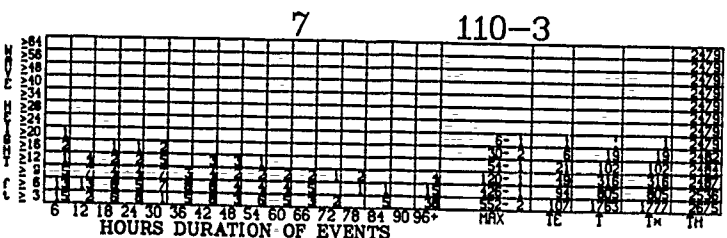
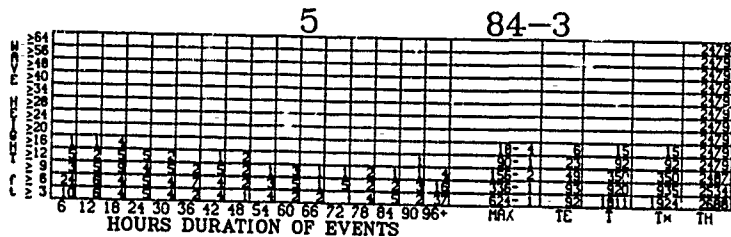
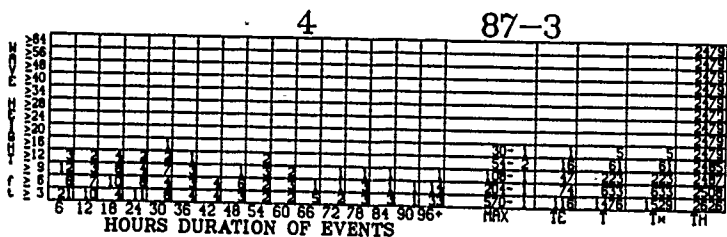
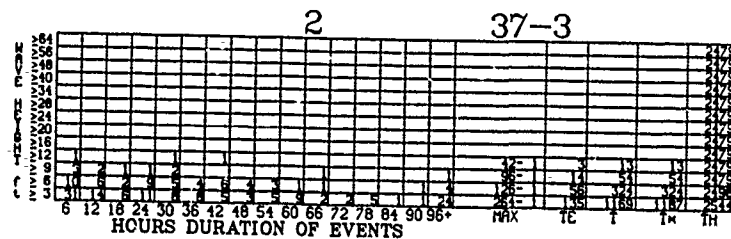
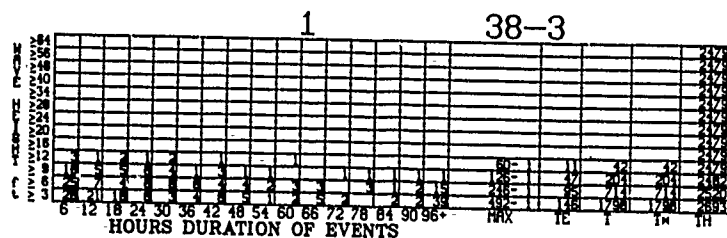
## WAVE HEIGHT DURATIONS (Cont'd)



APRIL

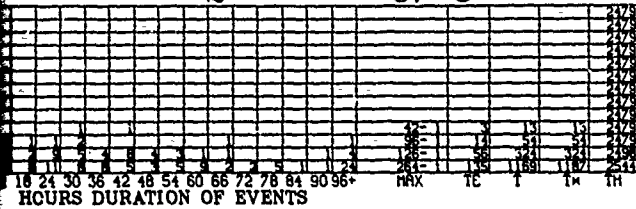


# JULY

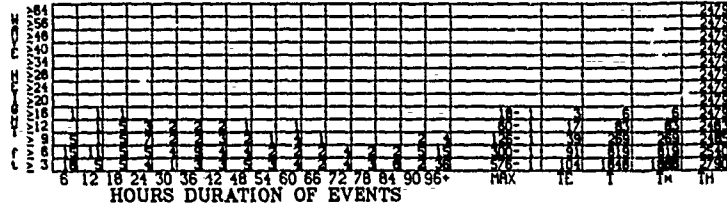


# WAVE HEIGHT DURATIONS

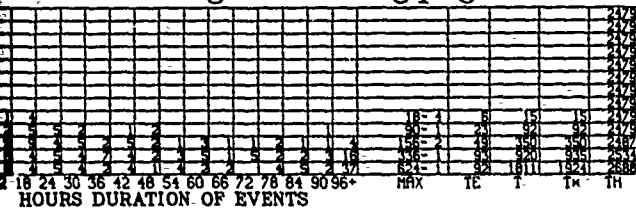
2 37-3



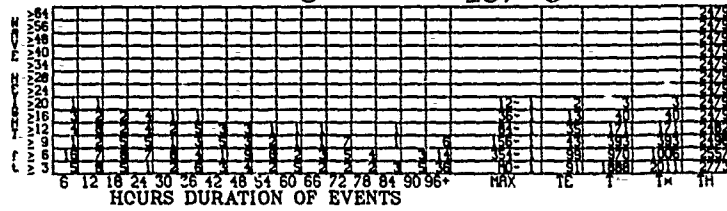
3 62-3



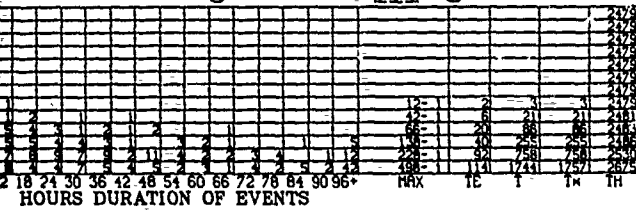
5 84-3



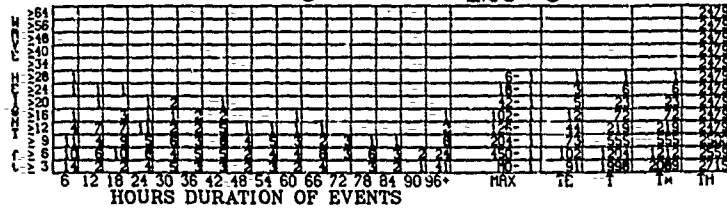
6 107-3



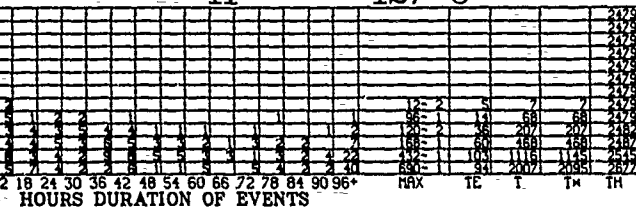
8 111-3



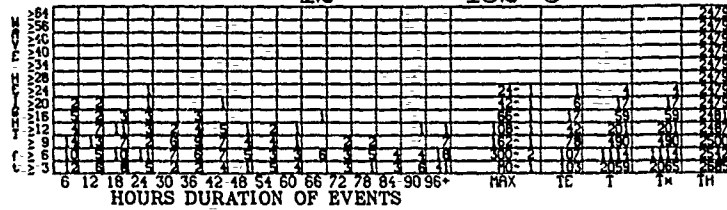
9 129-3



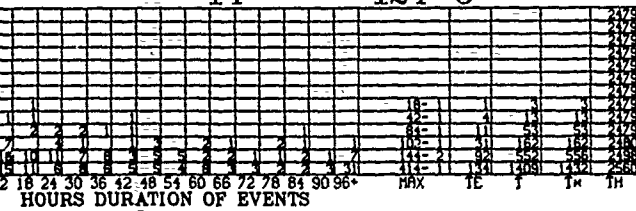
11 127-3



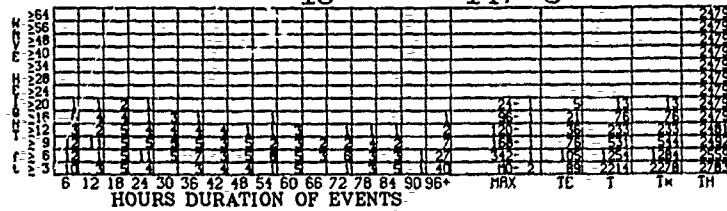
12 132-3



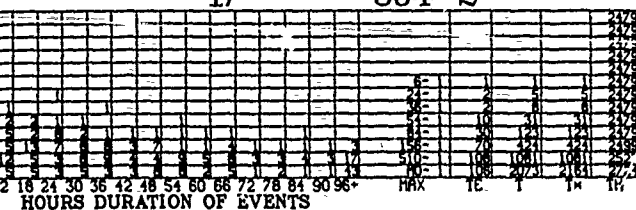
14 124-3



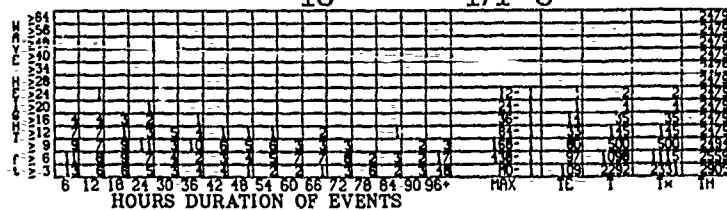
15 147-3



17 304-2



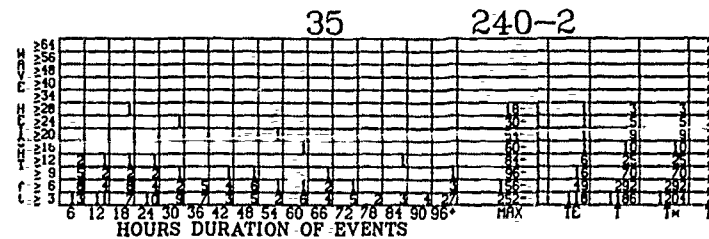
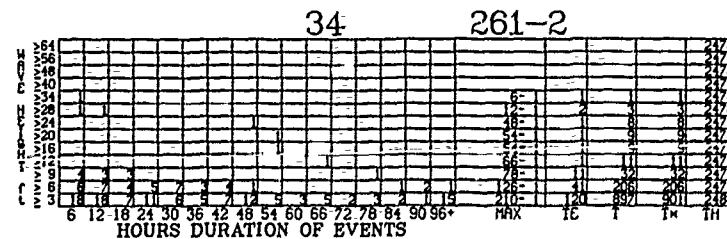
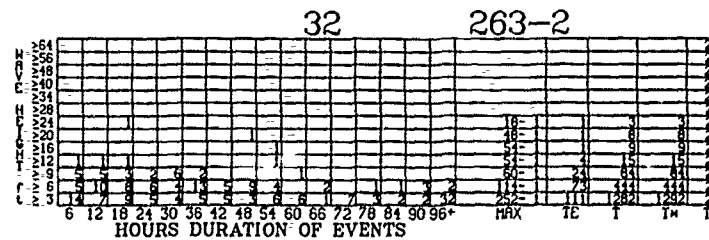
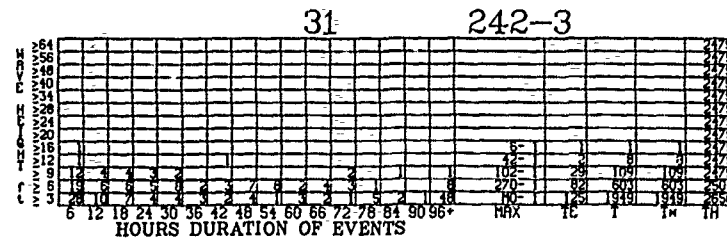
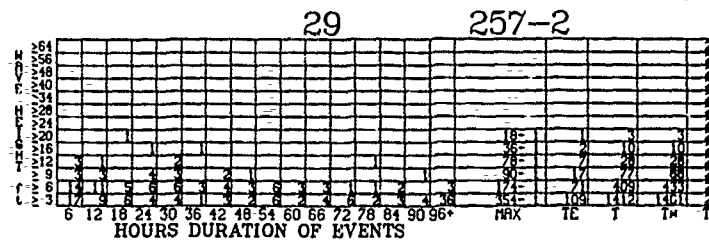
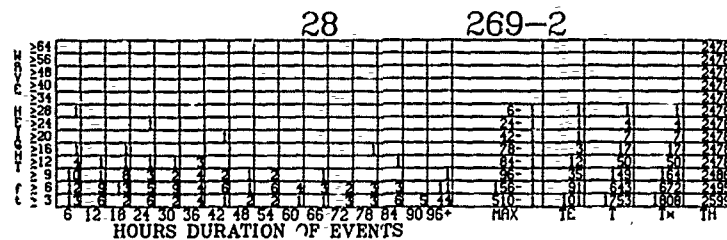
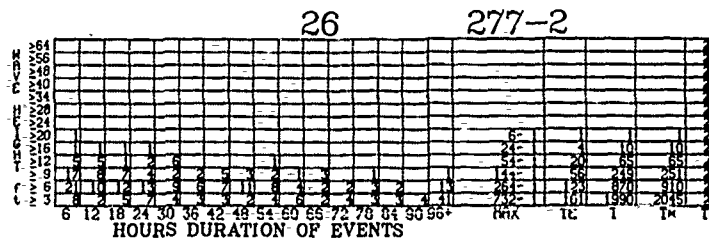
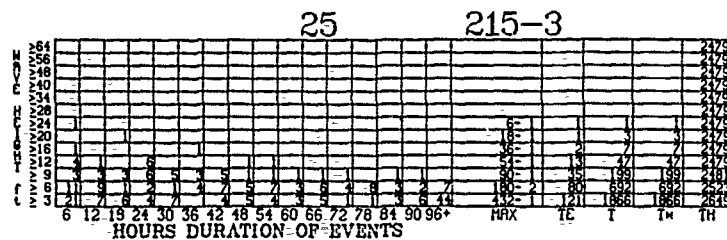
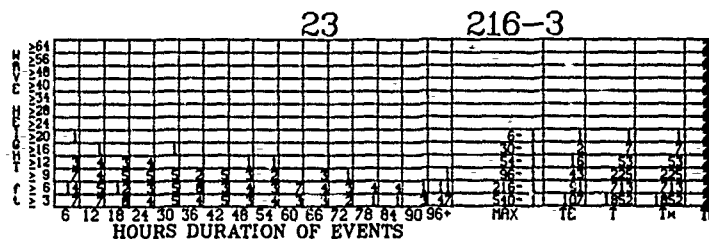
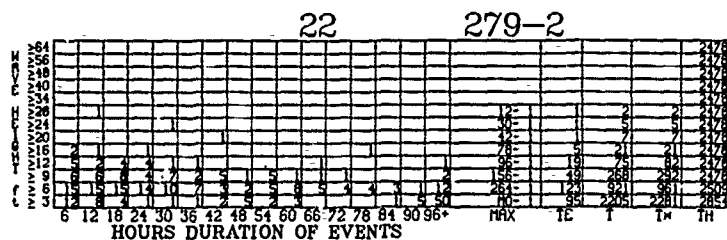
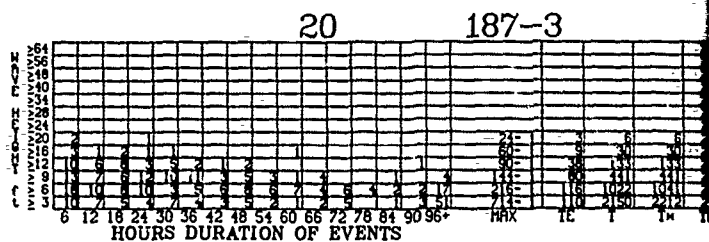
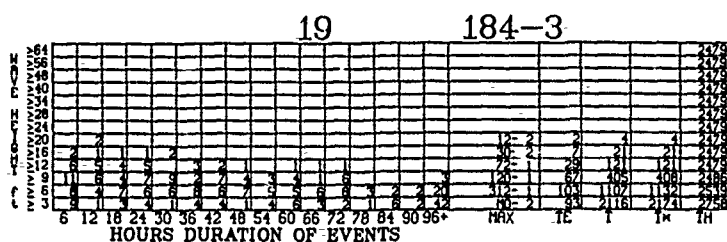
18 171-3



(2)



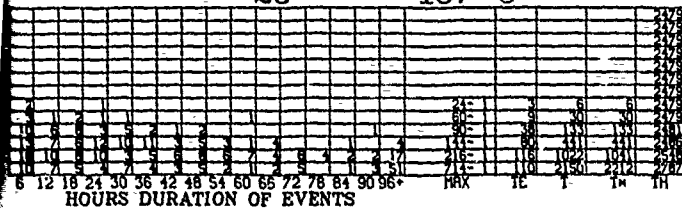
# WAVE HEIGHT DURATIONS (Cont'd)



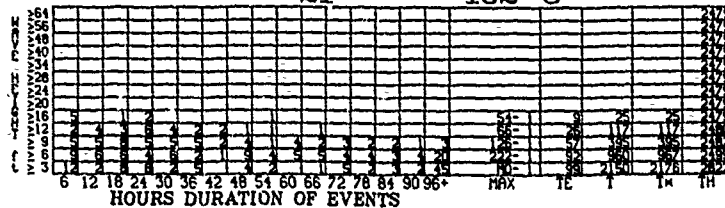
d)

JULY

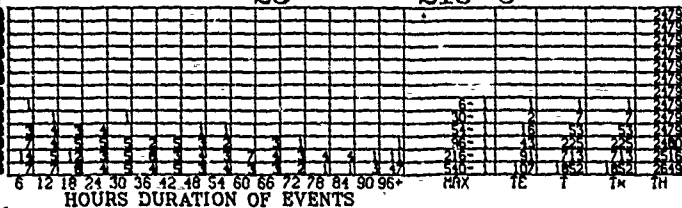
20 187-3



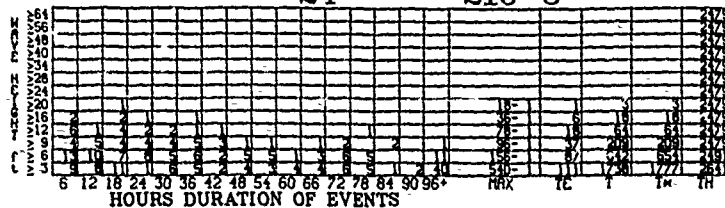
21 182-3



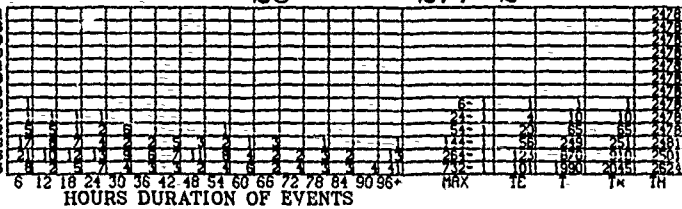
23 216-3



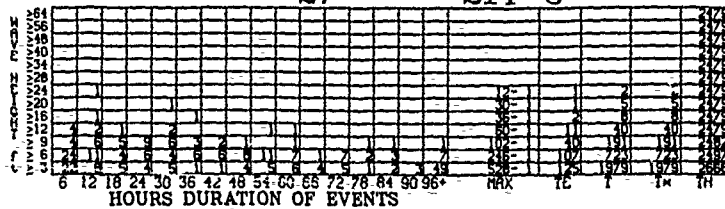
24 218-3



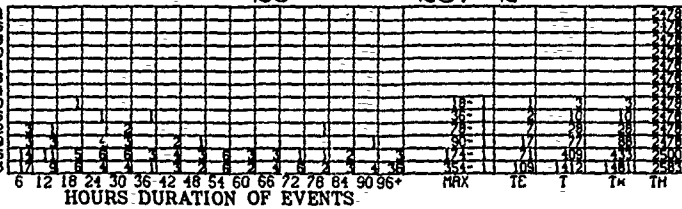
26 277-2



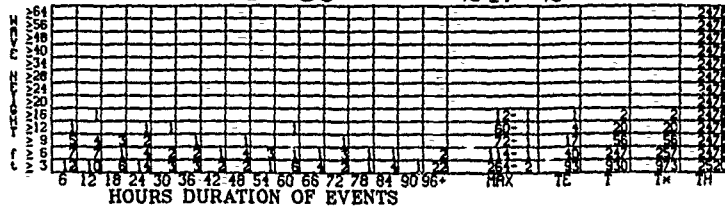
27 214-3



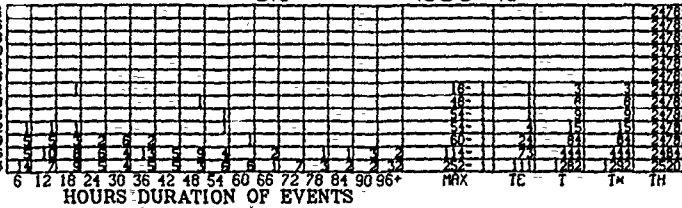
29 257-2



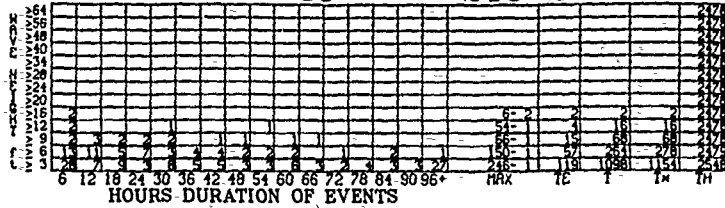
30 247-2



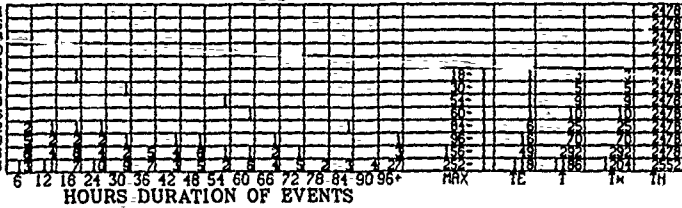
32 263-2



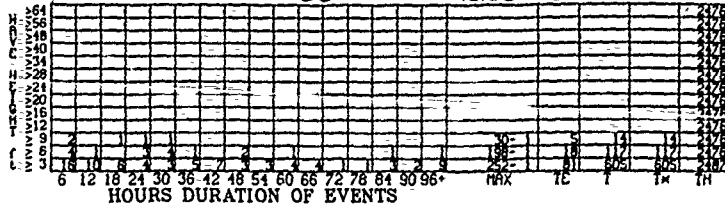
33 243-2



35 240-2



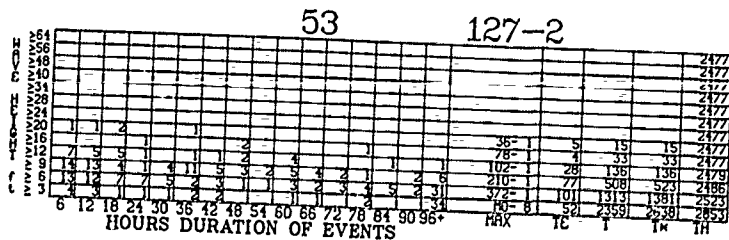
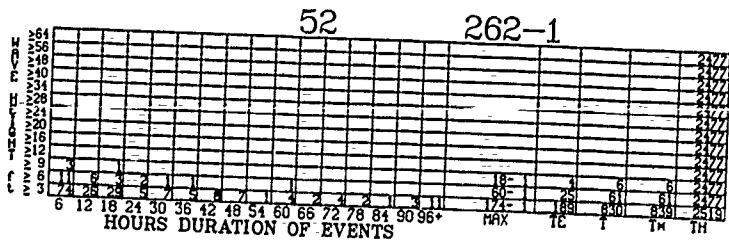
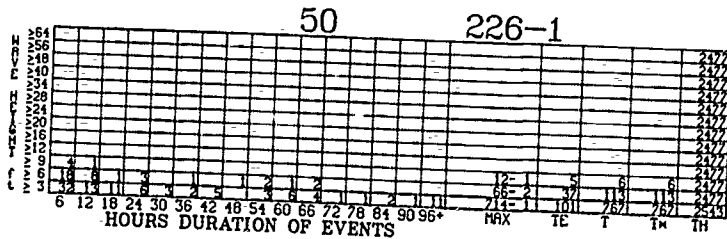
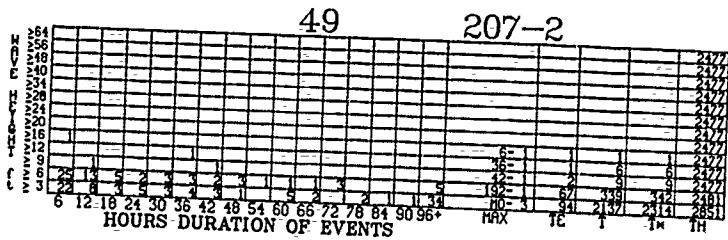
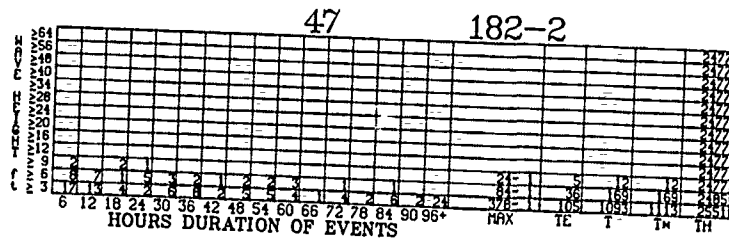
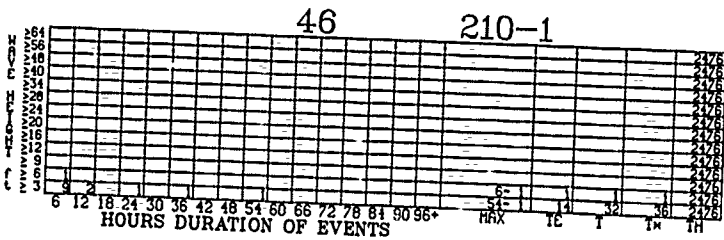
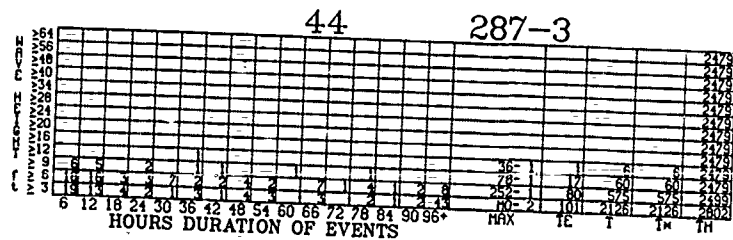
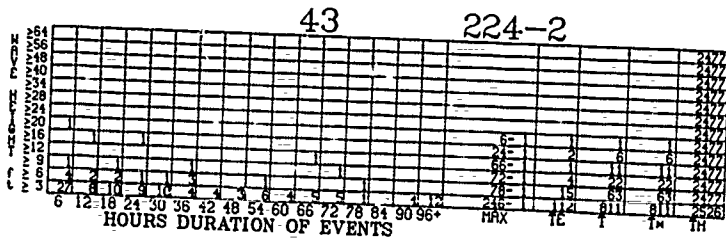
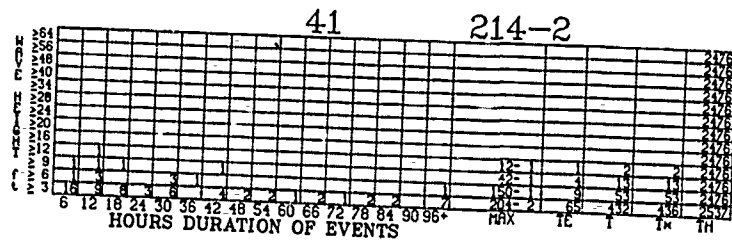
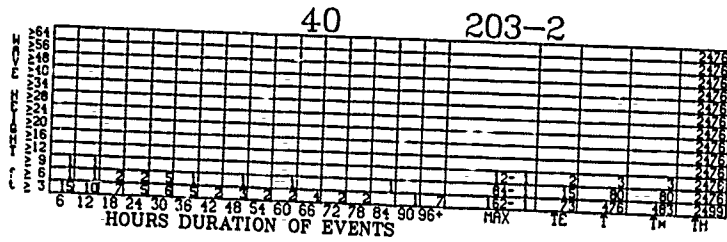
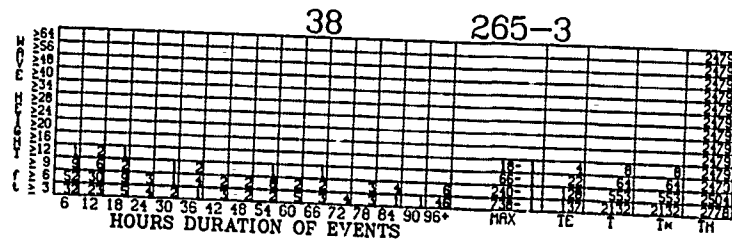
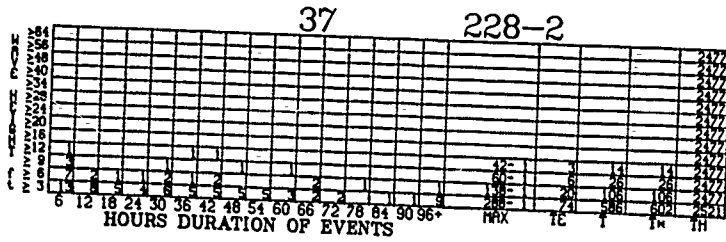
36 220-2



2

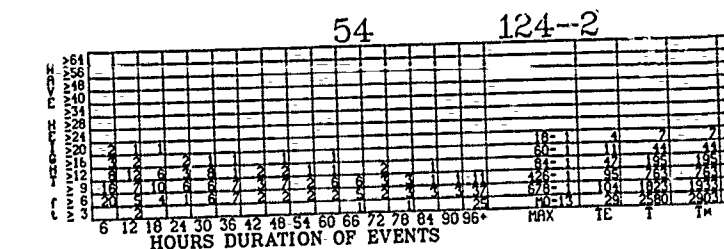
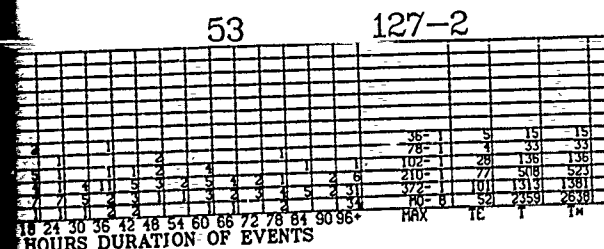
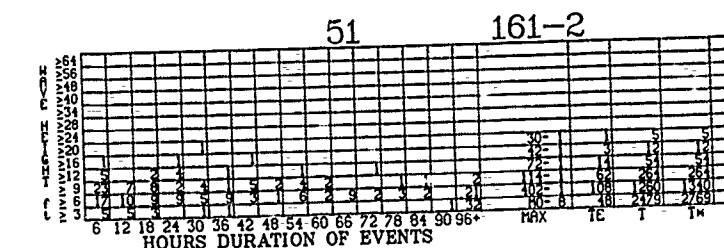
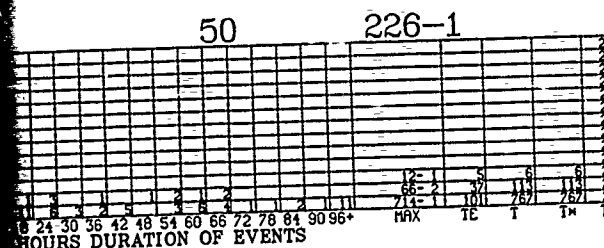
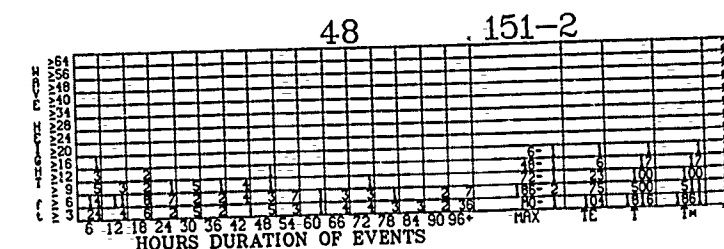
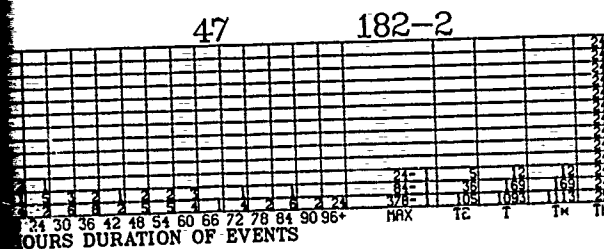
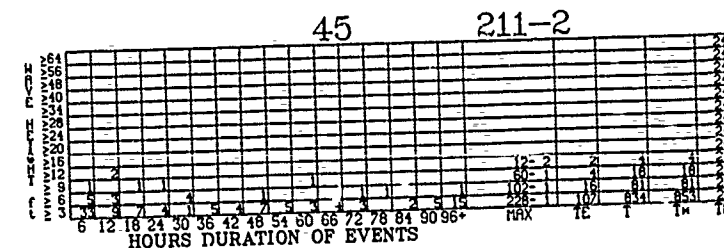
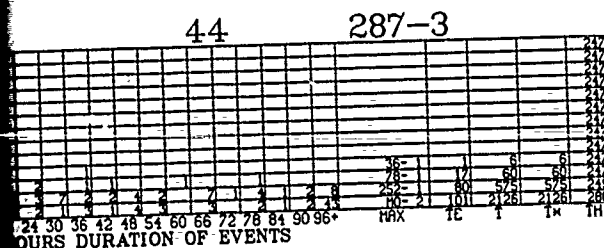
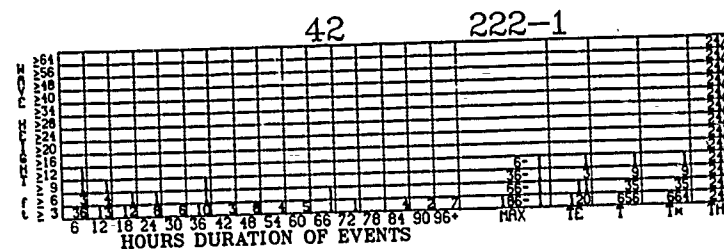
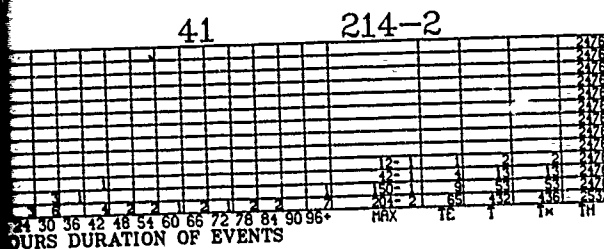
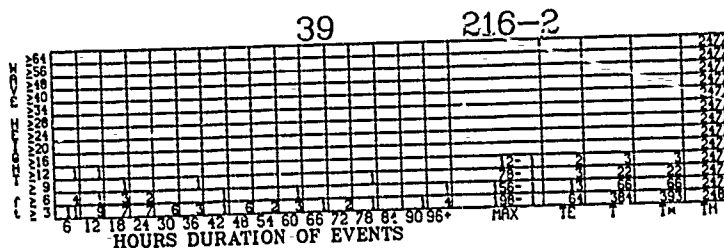
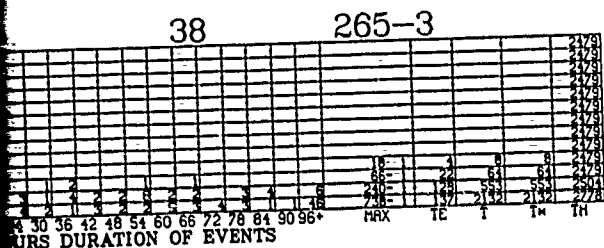
JULY

WAVE

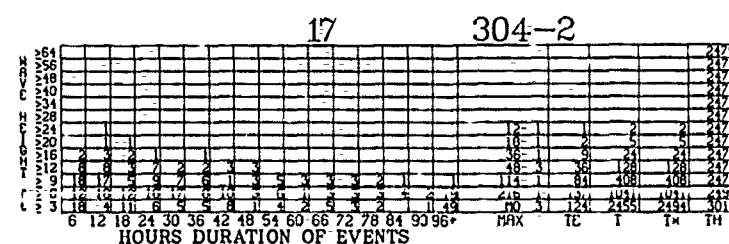
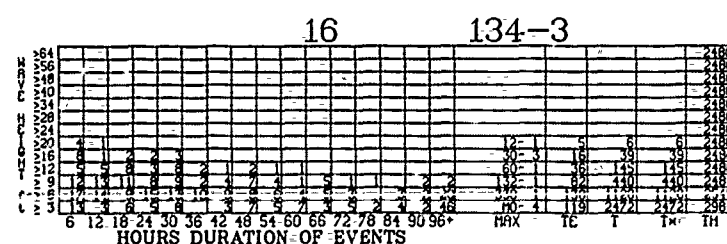
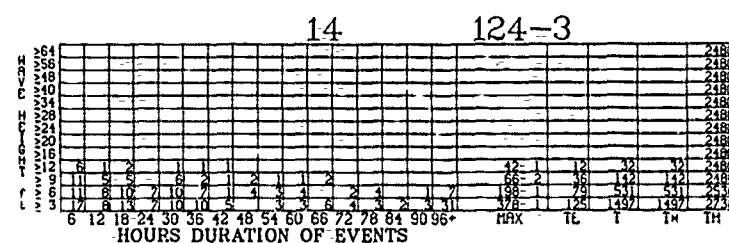
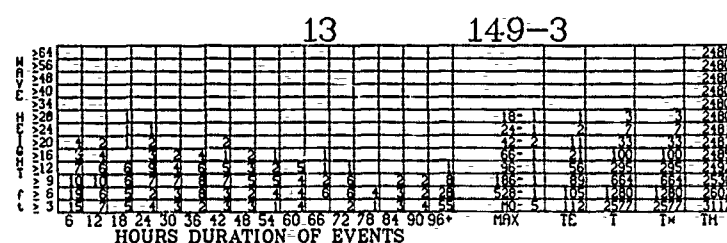
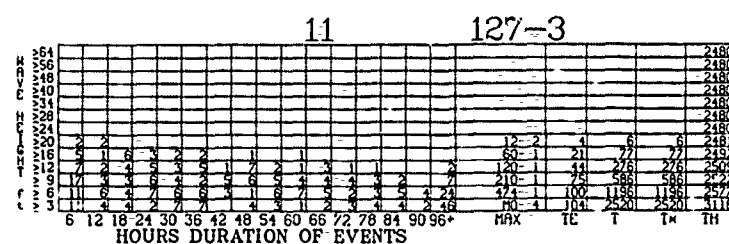
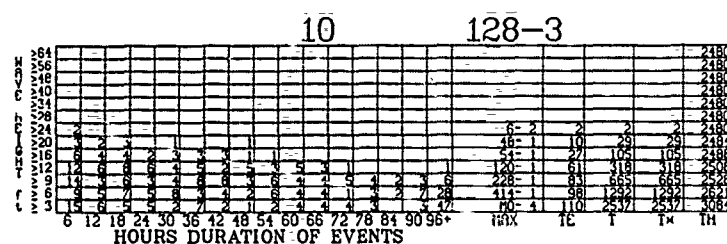
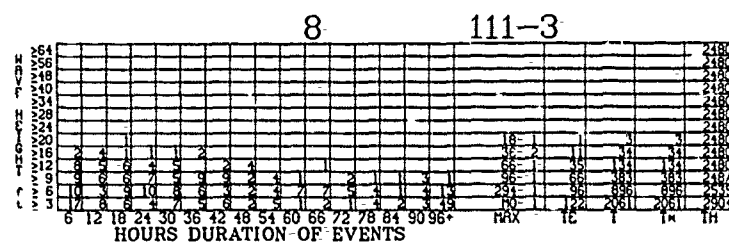
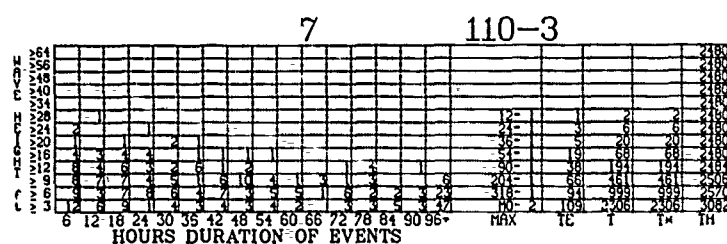
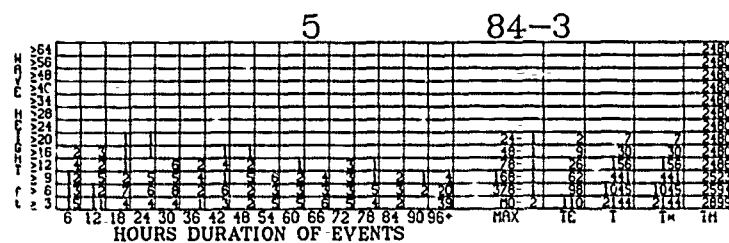
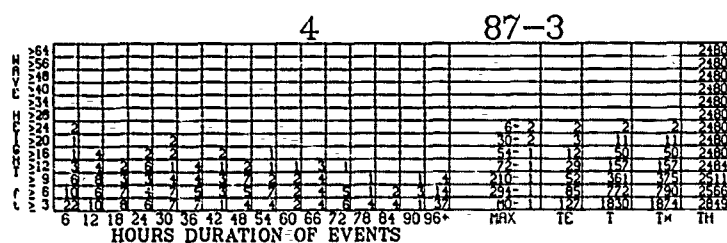
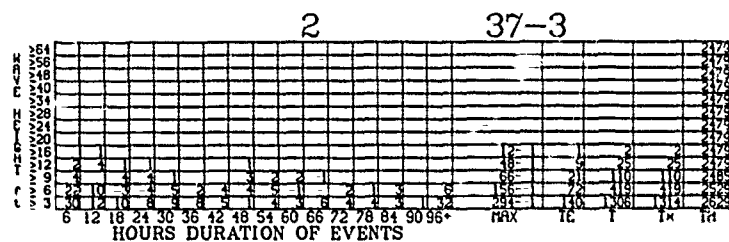
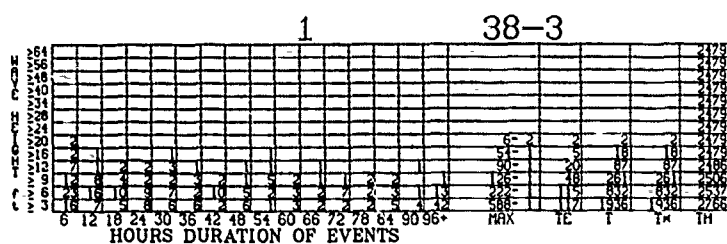


①

# WAVE HEIGHT DURATIONS (Cont'd)



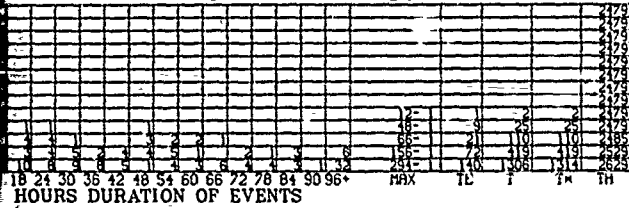
# WAVE HEIGHT DURATIONS



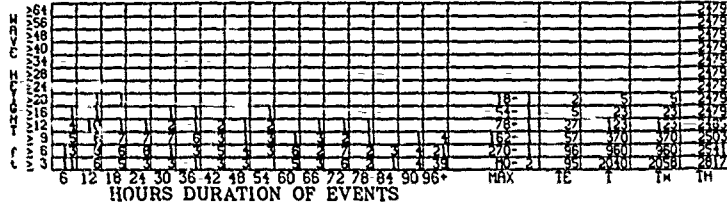
1

# AUGUST

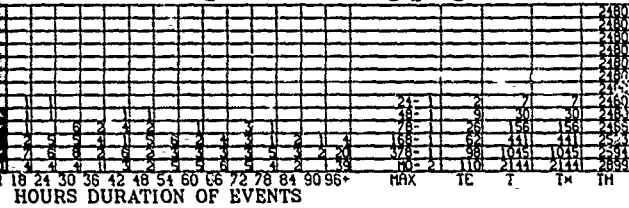
2 37-3



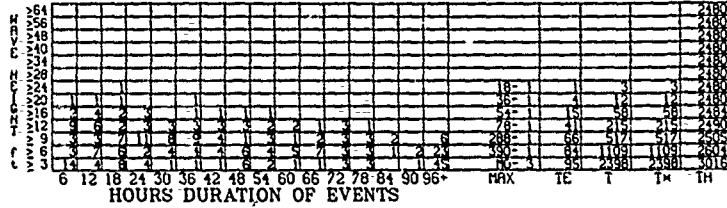
3 62-3



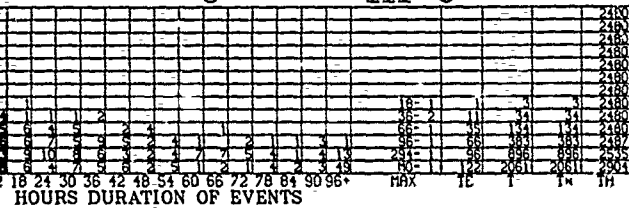
5 84-3



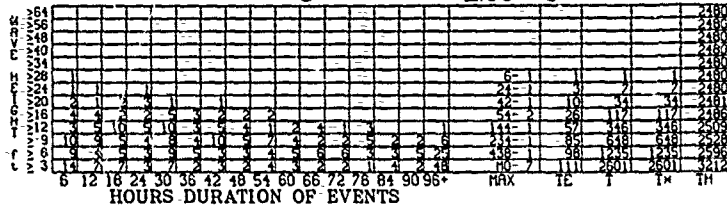
6 107-3



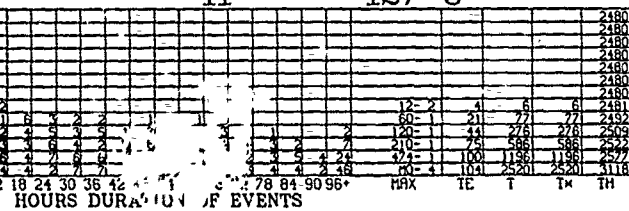
8 111-3



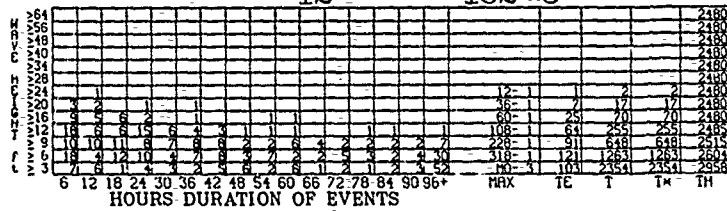
9 129-3



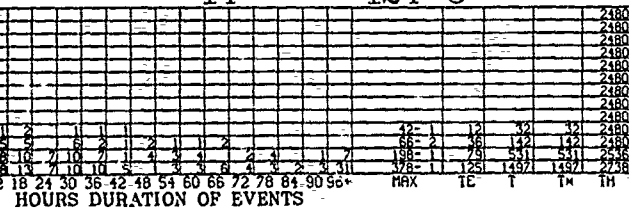
11 127-3



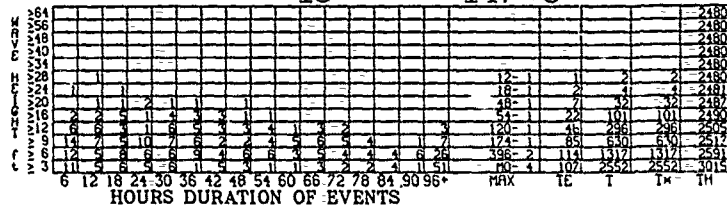
12 132-3



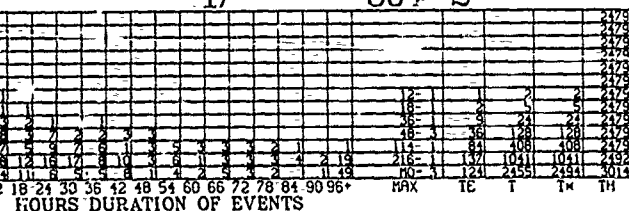
14 124-3



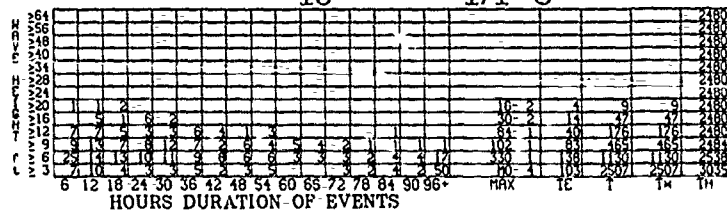
15 147-3



17 304-2



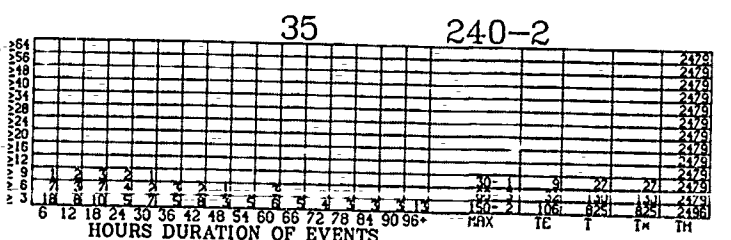
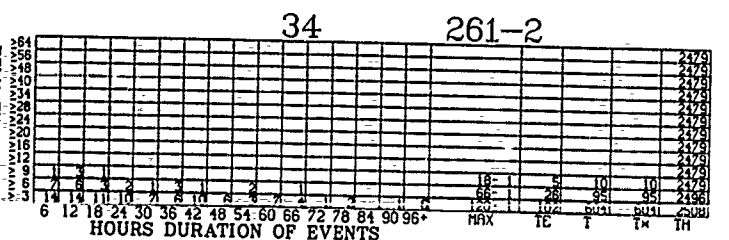
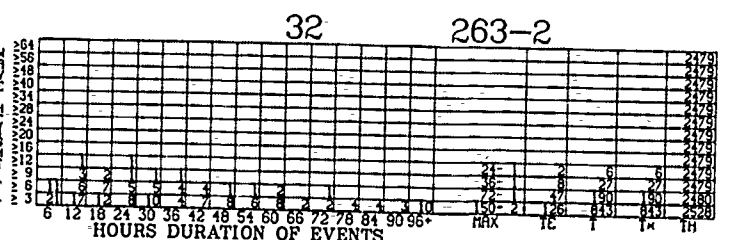
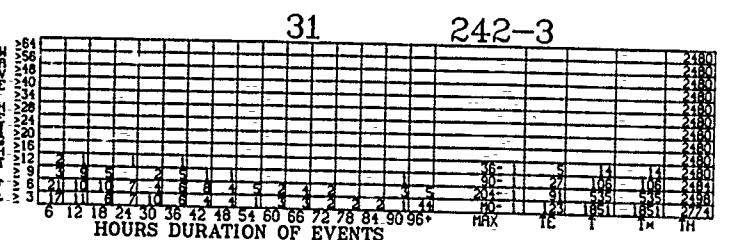
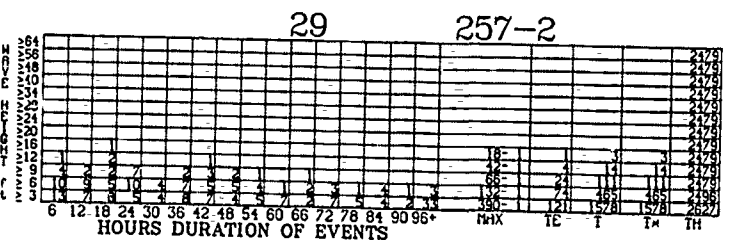
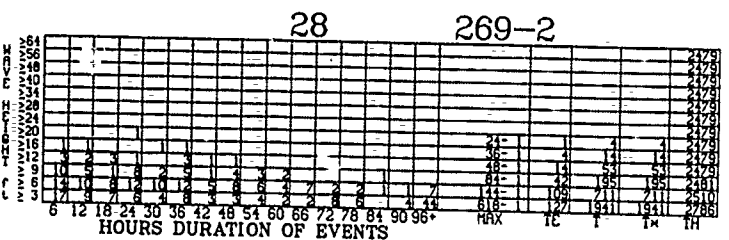
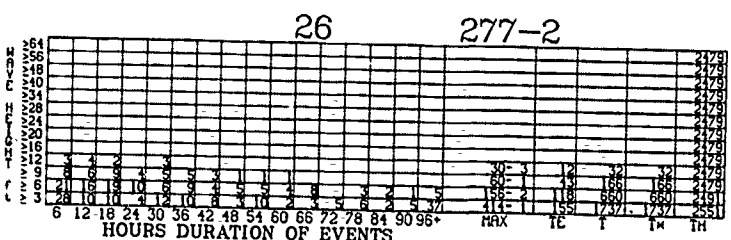
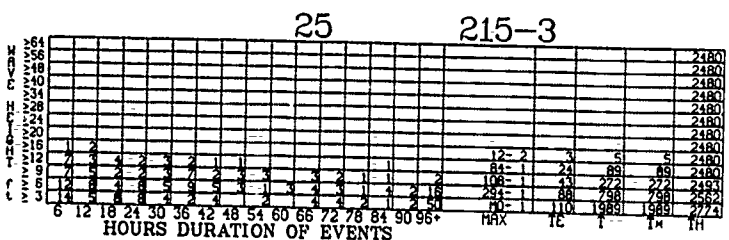
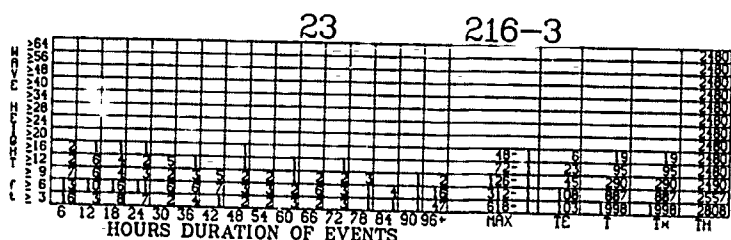
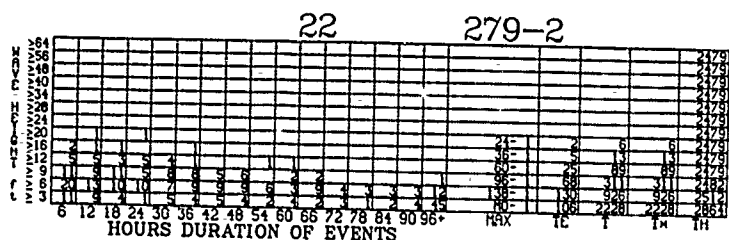
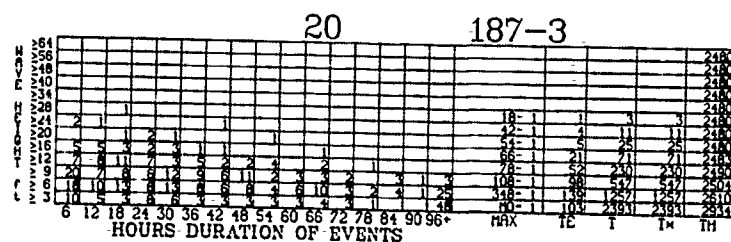
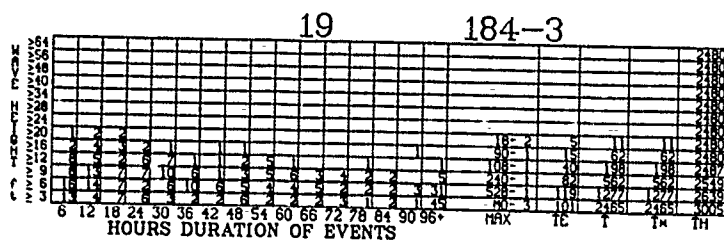
18 171-3





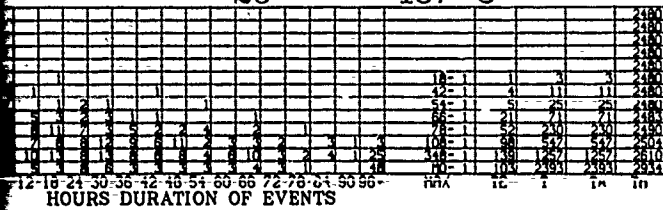
# AUGUST

WAV

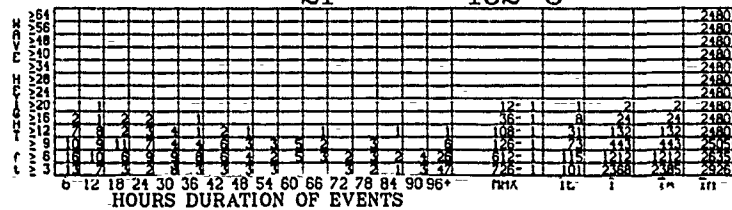


# WAVE HEIGHT DURATIONS (Cont'd)

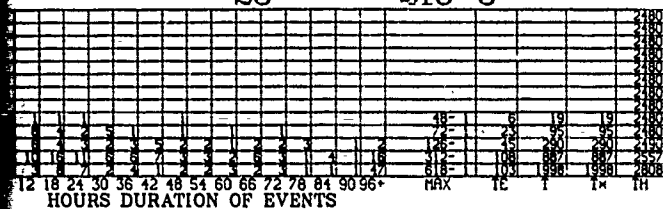
20 187-3



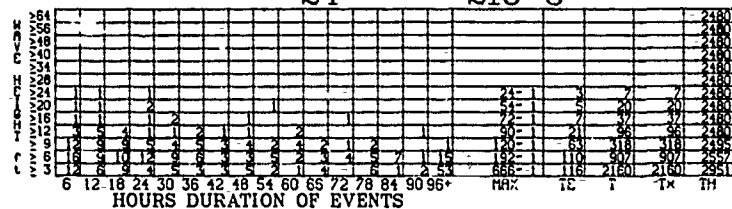
21 182-3



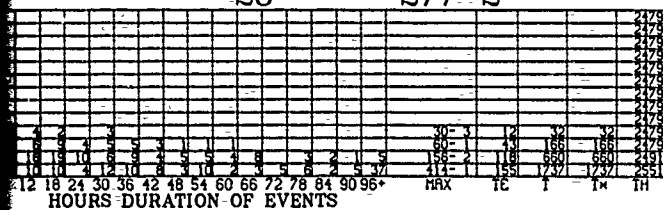
23 216-3



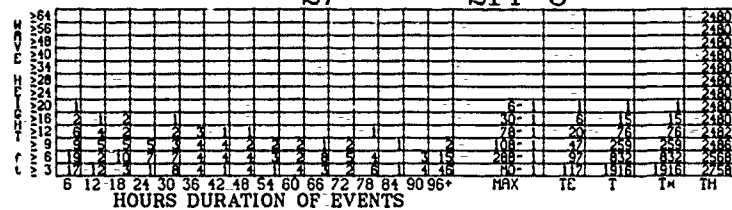
24 218-3



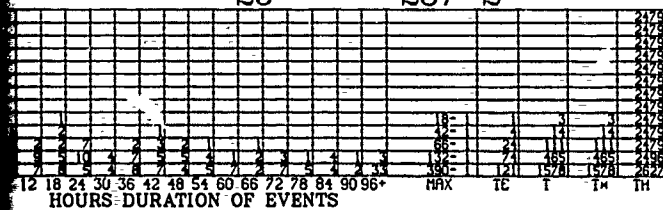
26 277-2



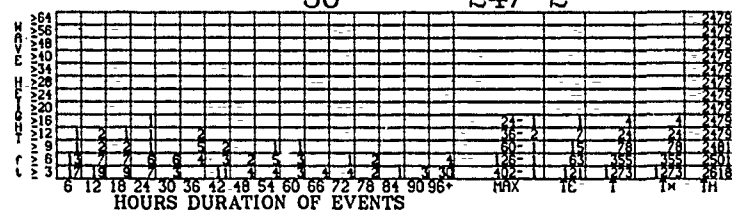
27 214-3



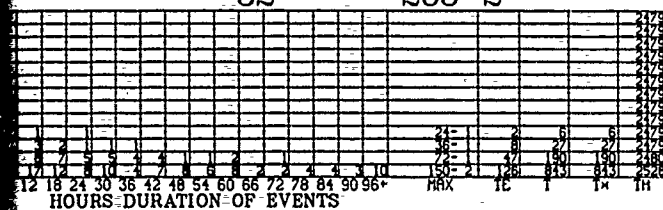
29 257-2



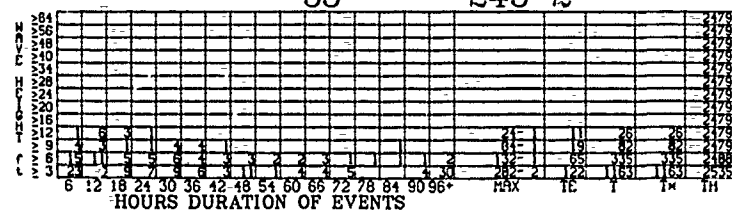
30 247-2



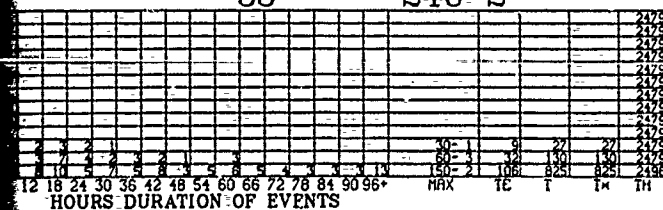
32 263-2



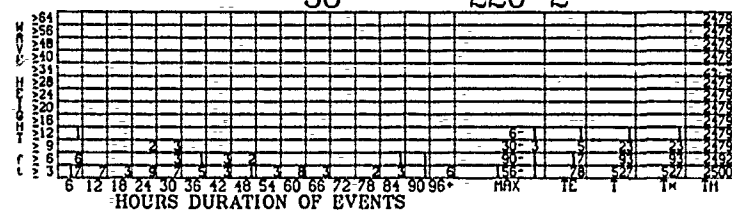
33 243-2



35 240-2



36 220-2

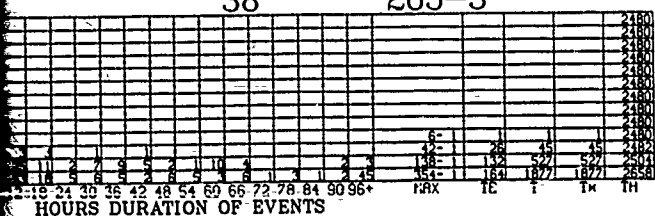




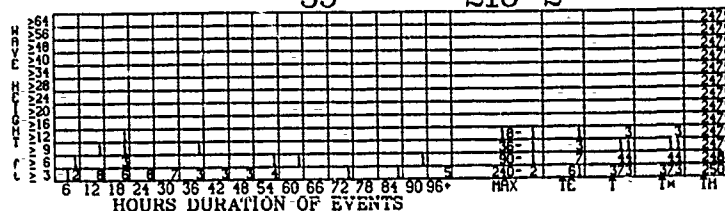
H)

AUGUST

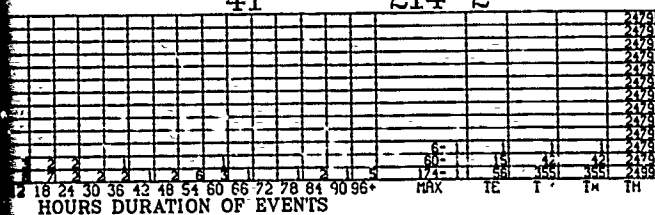
38 265-3



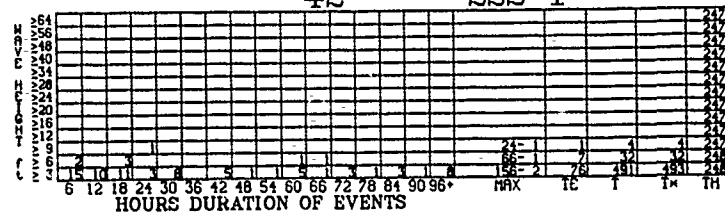
39 216-2



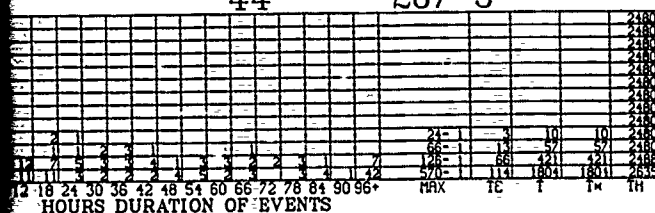
41 214-2



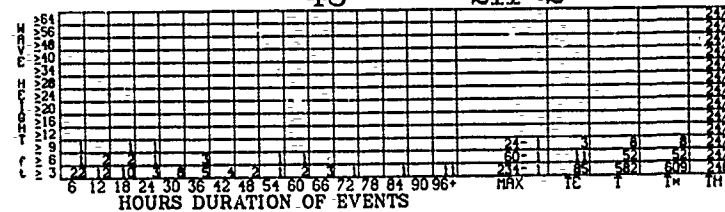
42 222-1



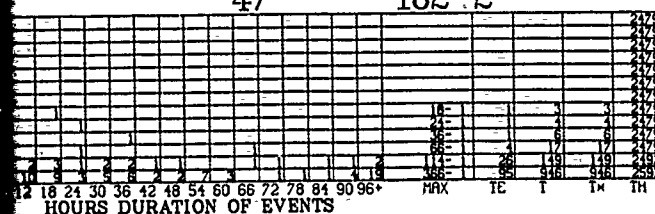
44 287-3



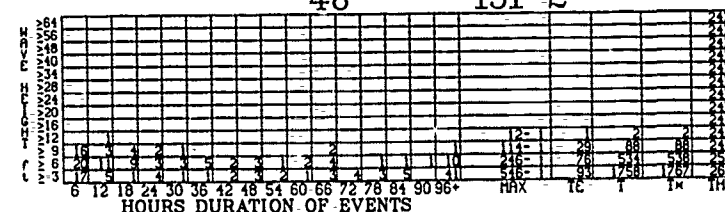
45 211-2



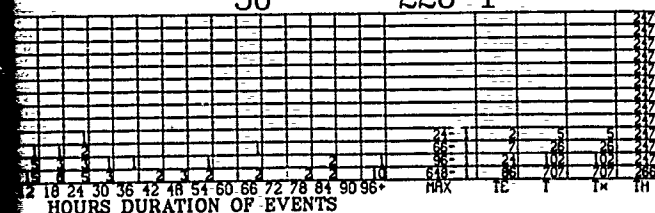
47 182-2



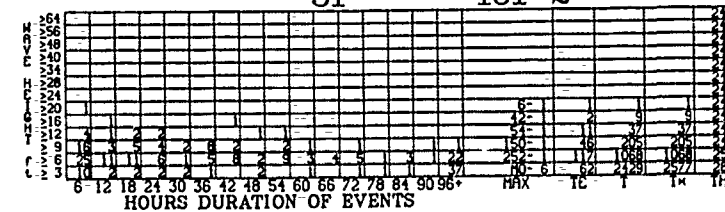
48 151-2



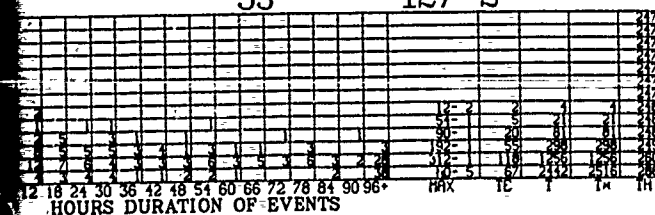
50 226-1



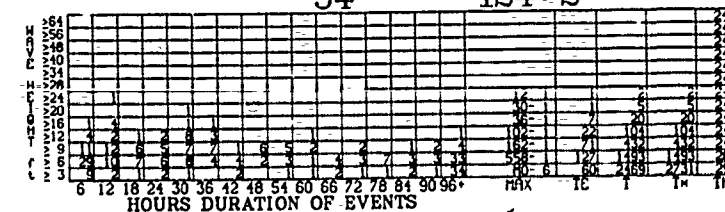
51 161-2



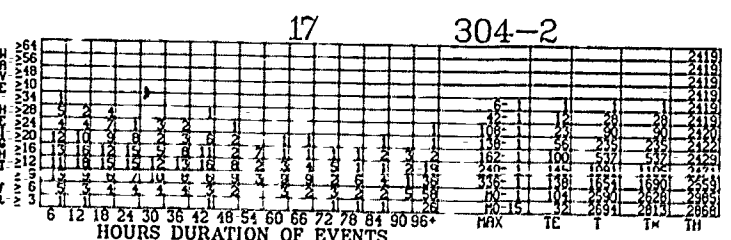
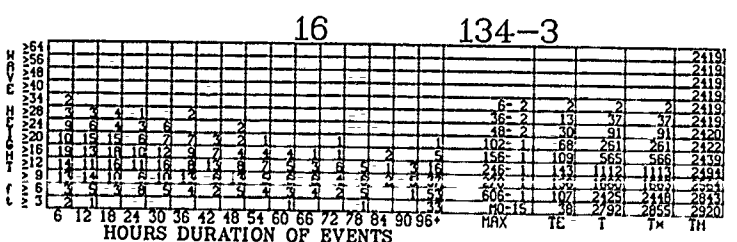
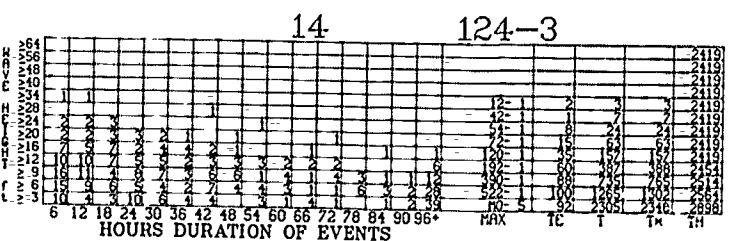
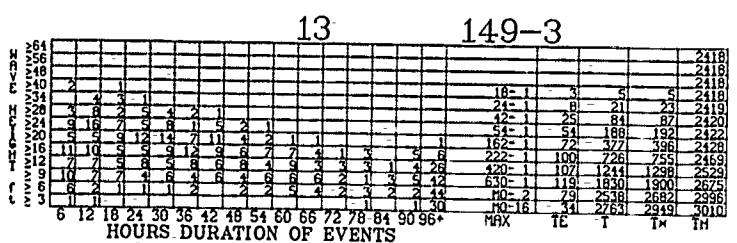
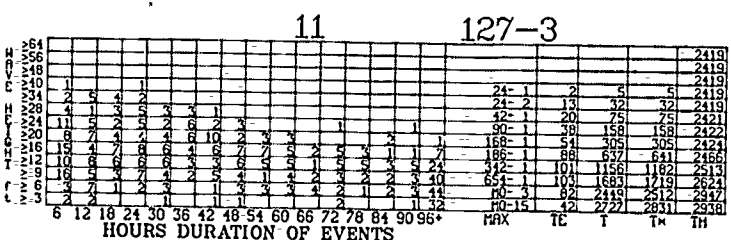
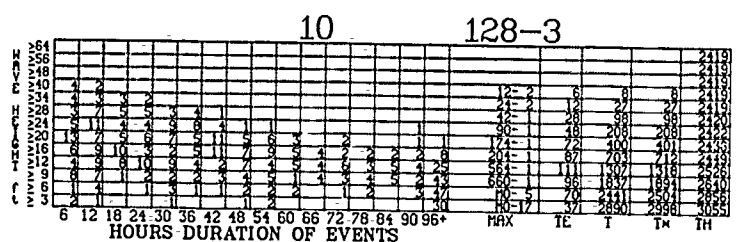
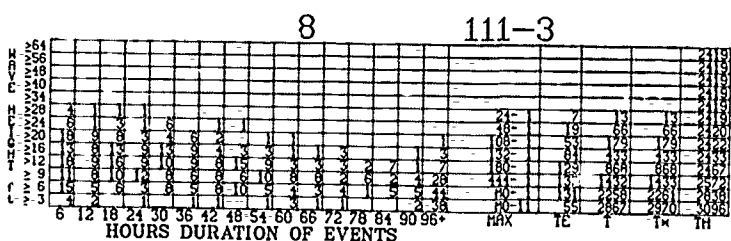
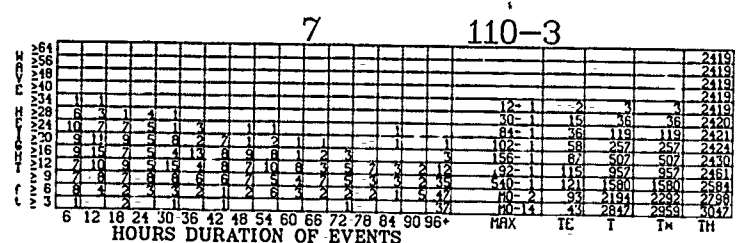
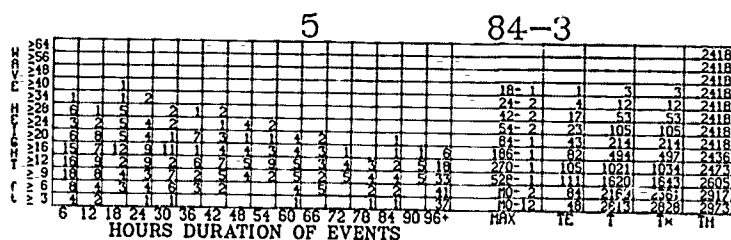
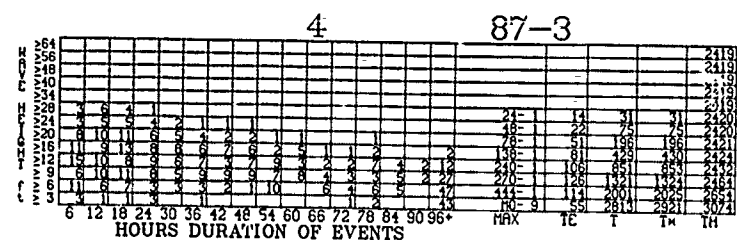
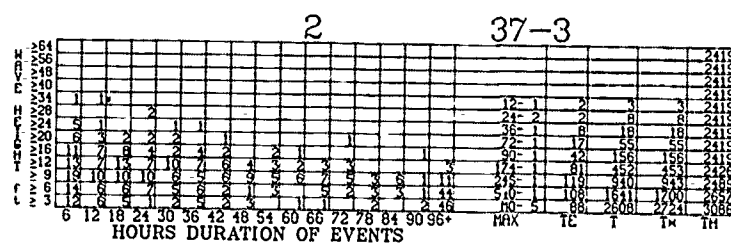
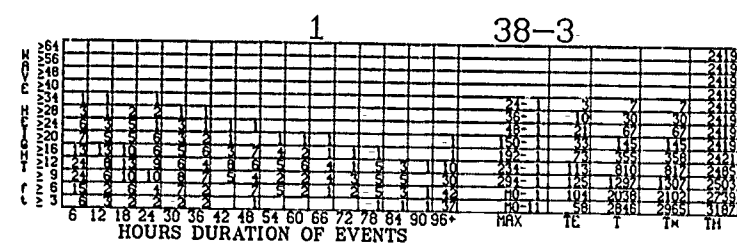
53 127-2



54 124-2

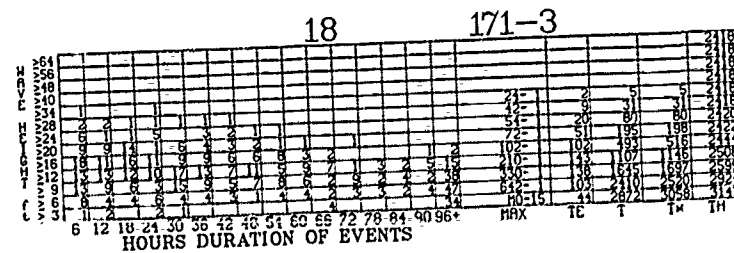
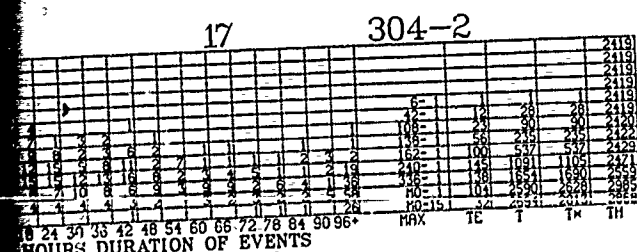
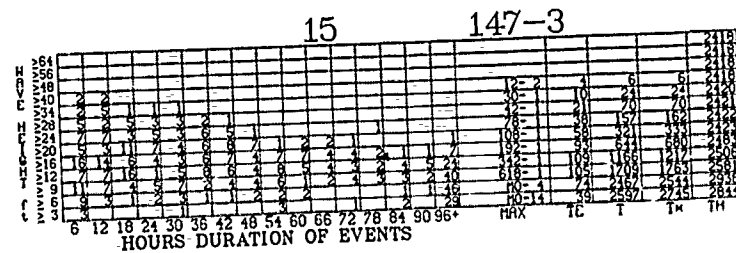
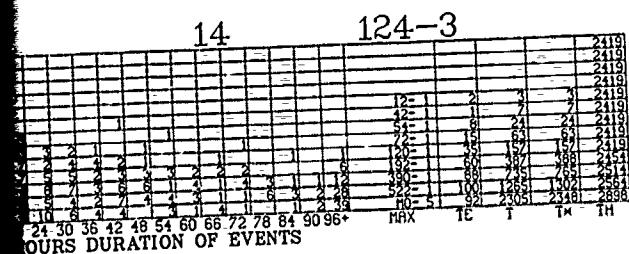
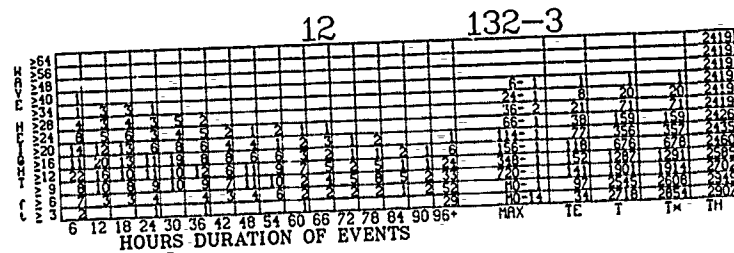
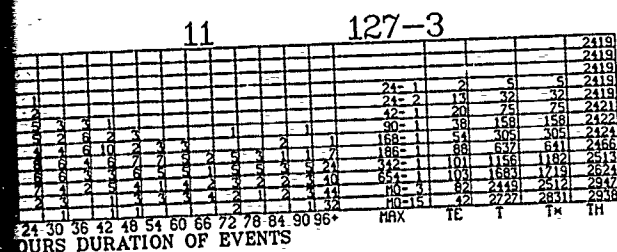
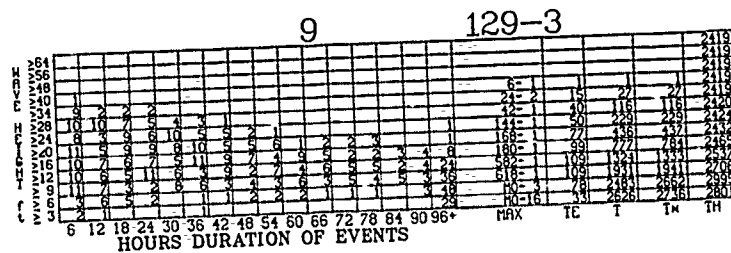
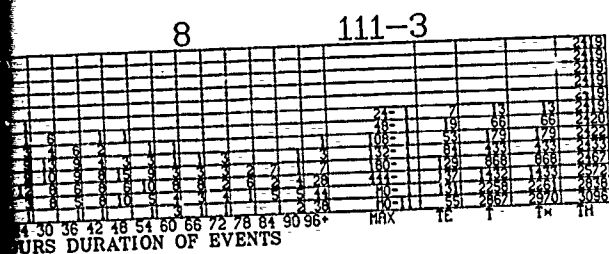
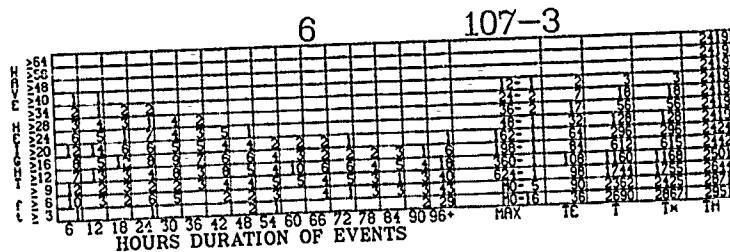
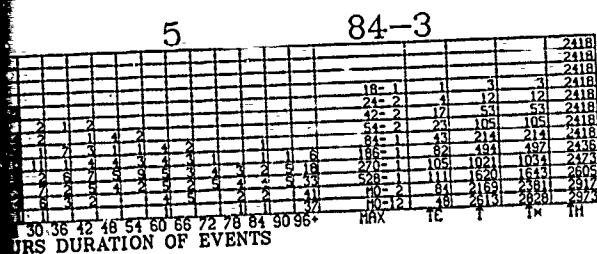
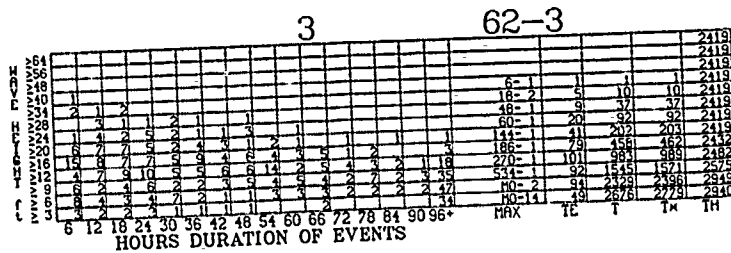
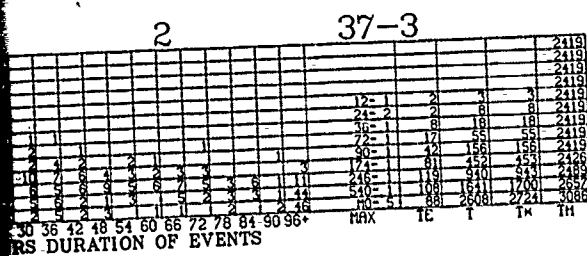


# OCTOBER



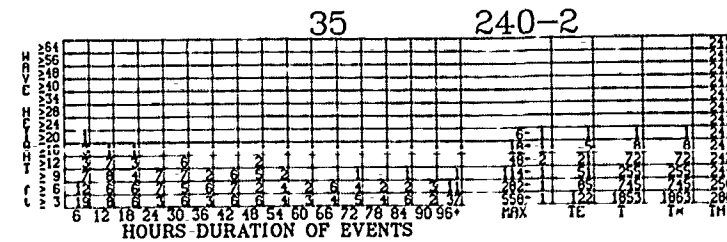
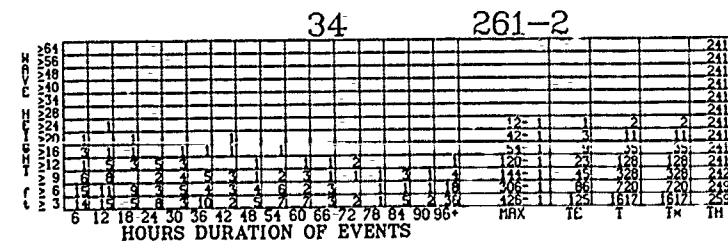
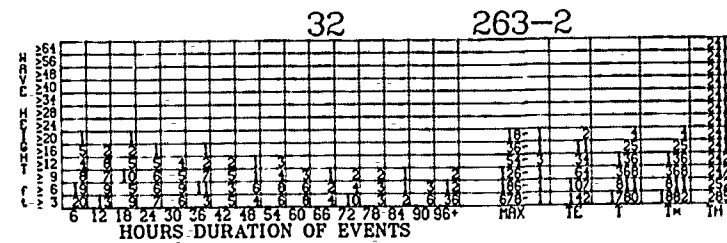
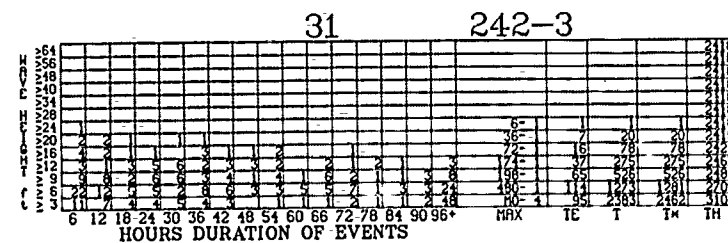
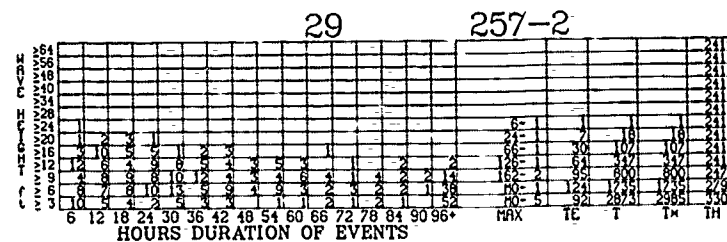
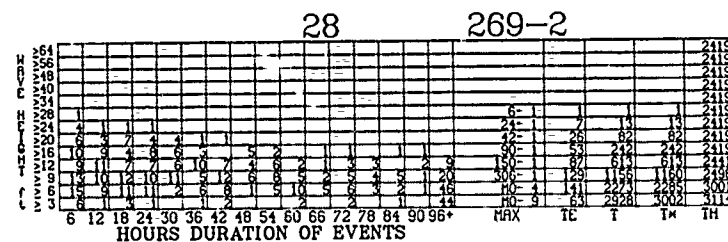
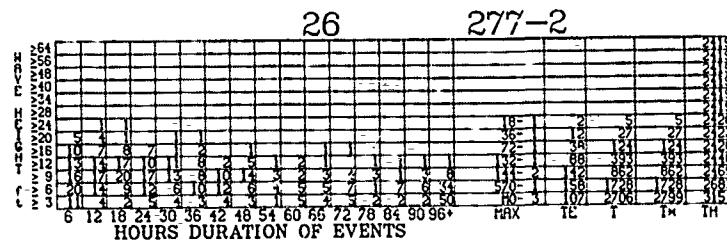
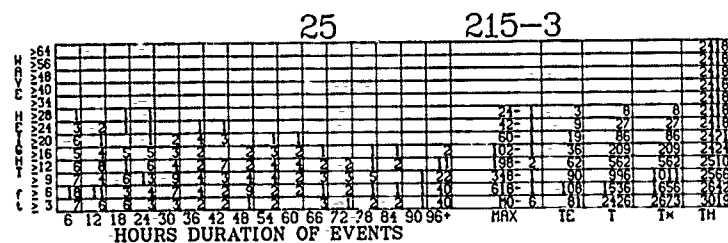
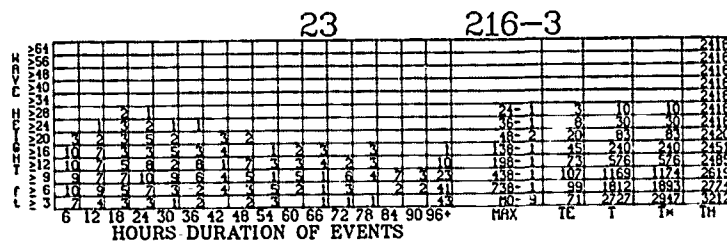
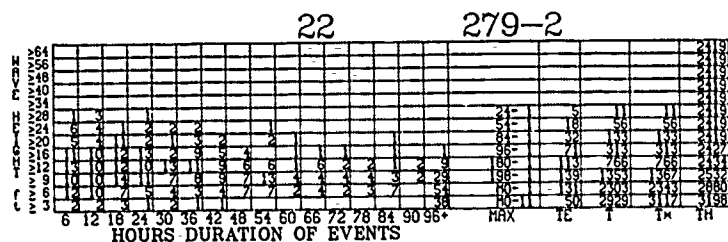
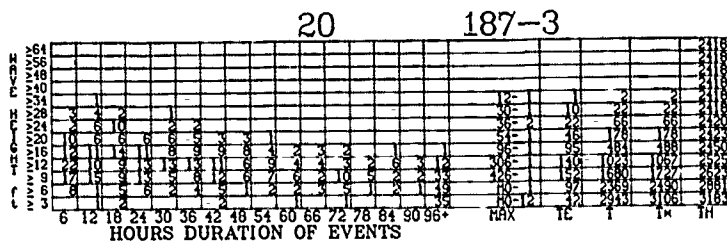
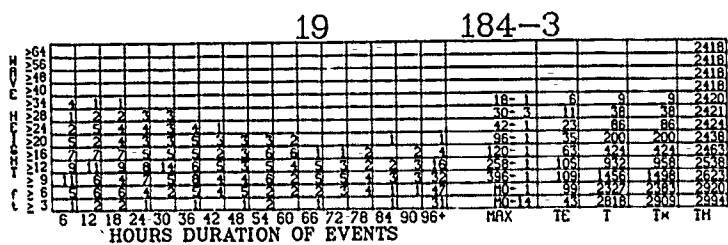


# WAVE HEIGHT DURATIONS





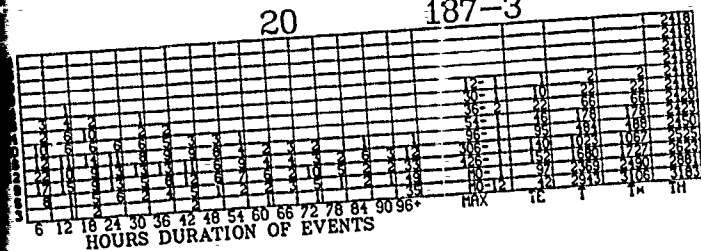
# WAVE HEIGHT DURATIONS (Cont'd)



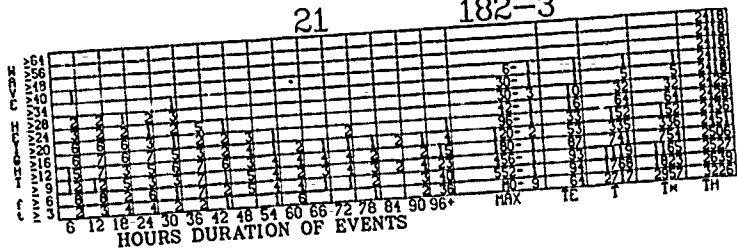
# OCTOBER

d)

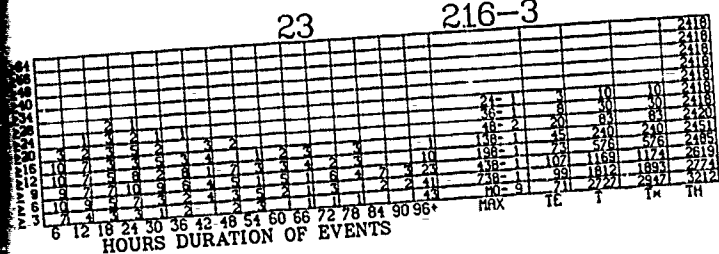
20 187-3



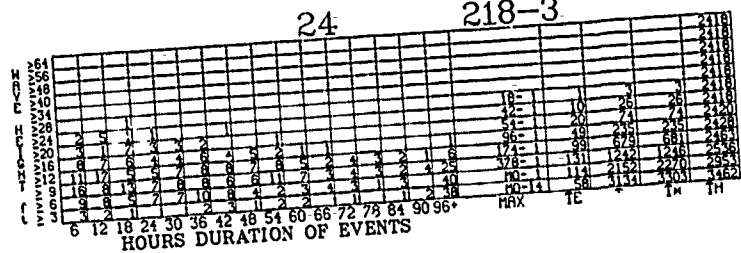
21 182-3



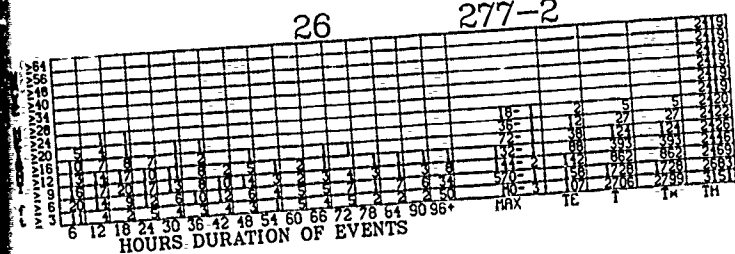
23 216-3



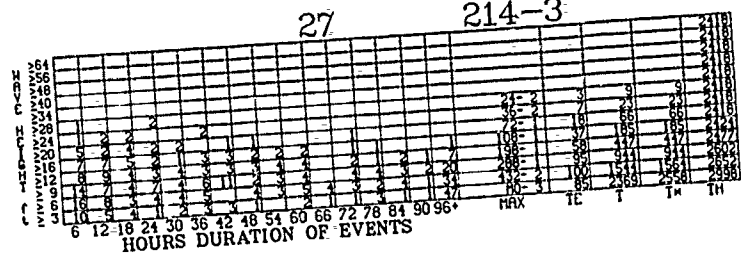
24 218-3



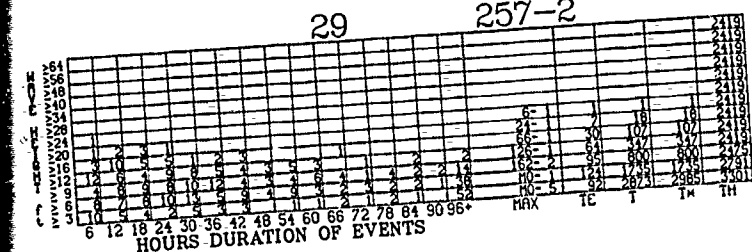
26 277-2



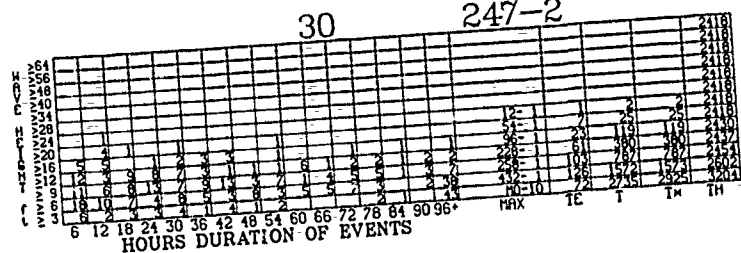
27 214-3



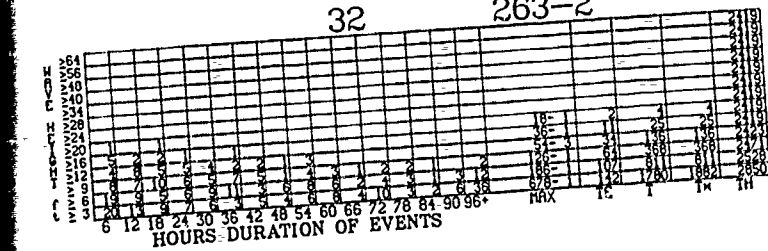
29 257-2



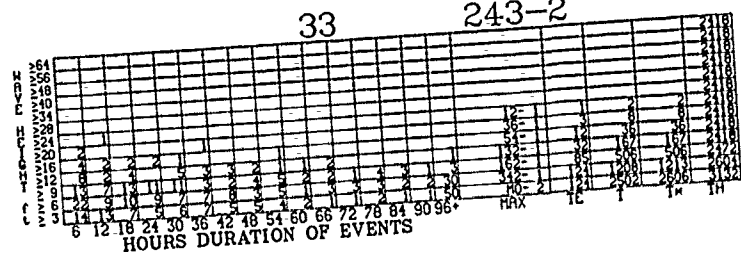
30 247-2



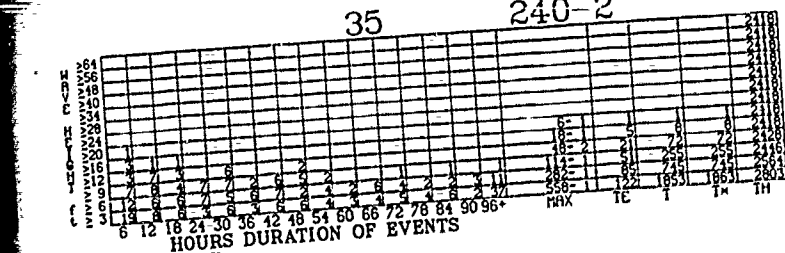
32 263-2



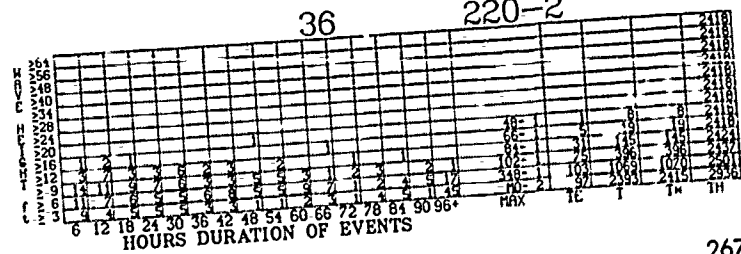
33 243-2



35 240-2

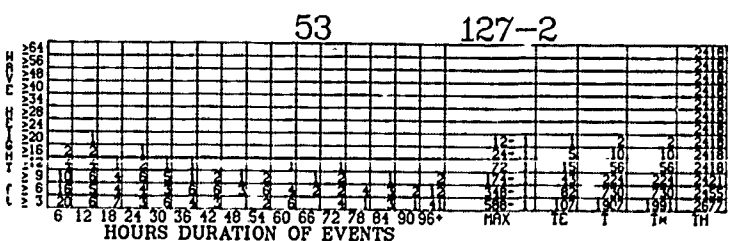
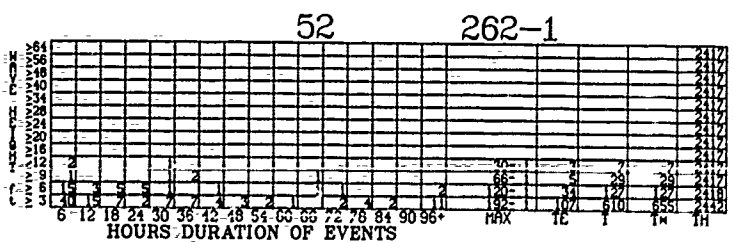
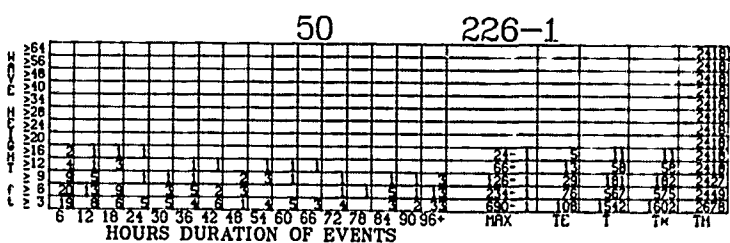
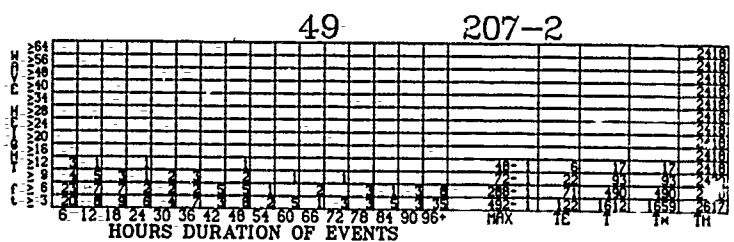
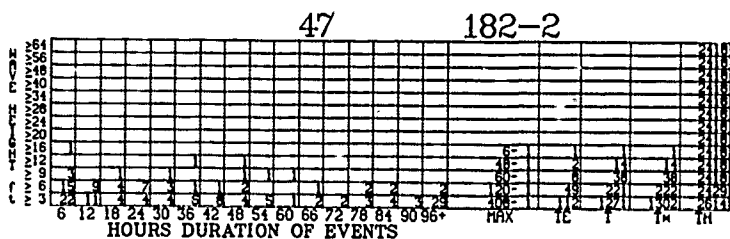
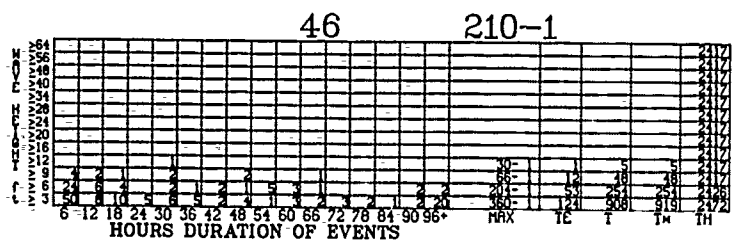
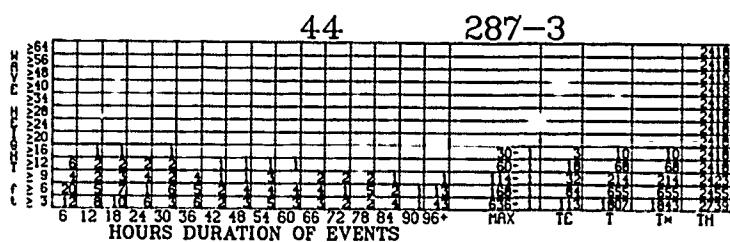
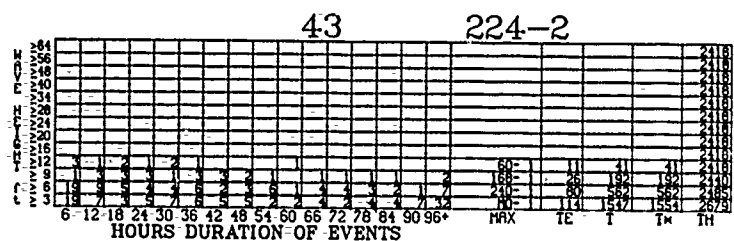
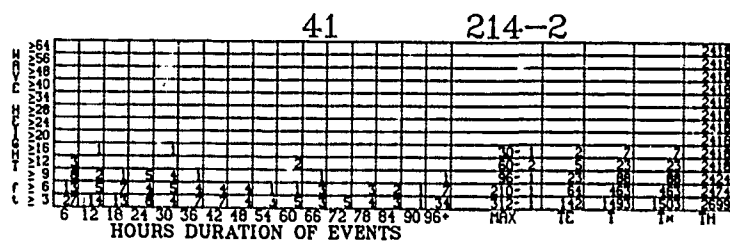
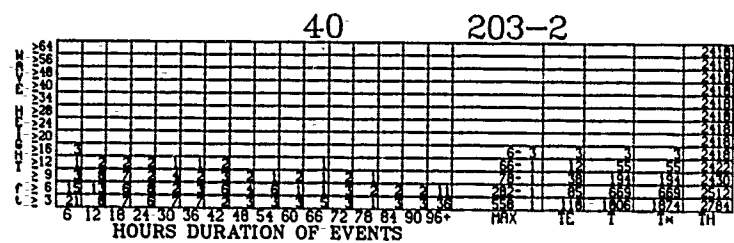
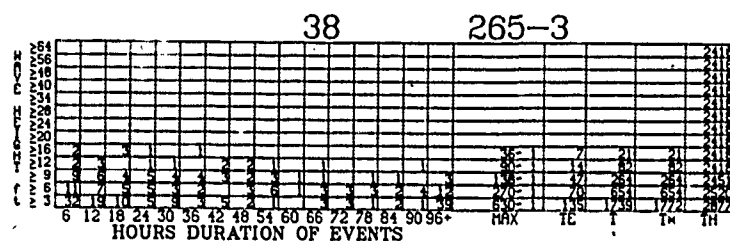
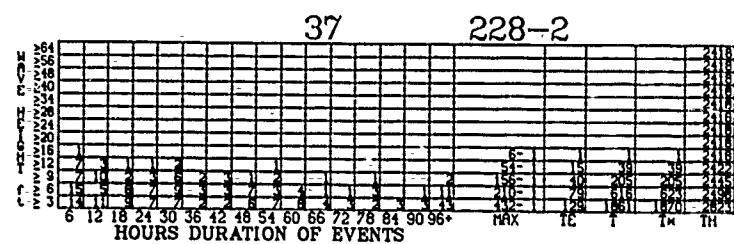


36 220-2



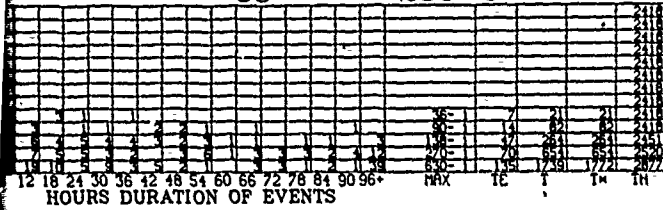
# OCTOBER

# WAVE K

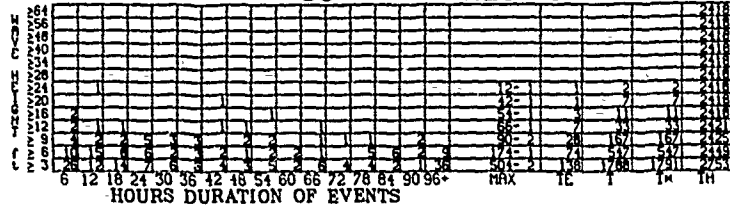


# WAVE HEIGHT DURATIONS (Cont'd)

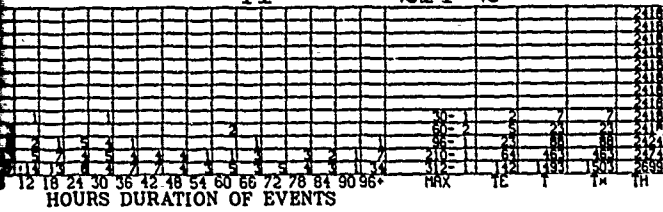
38 265-3



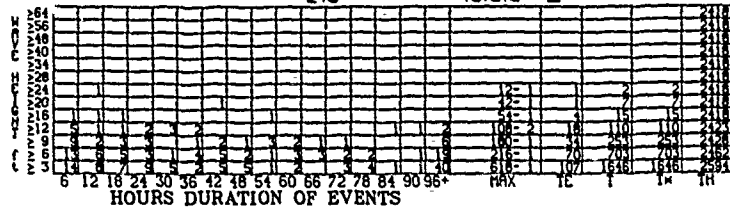
39 216-2



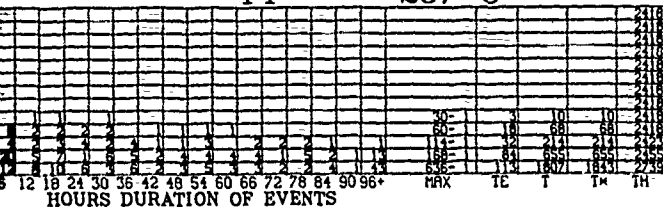
41 214-2



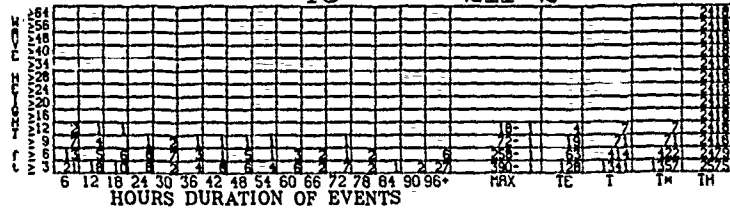
42 222-1



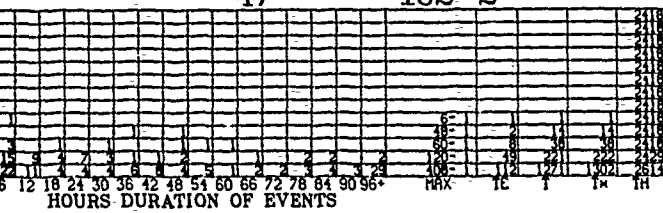
44 287-3



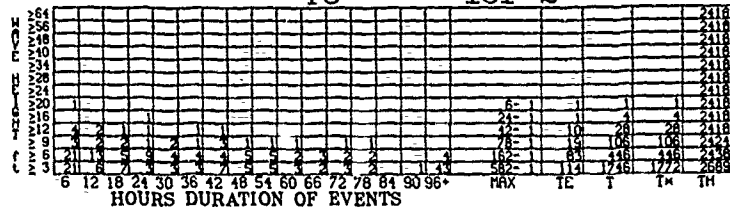
45 211-2



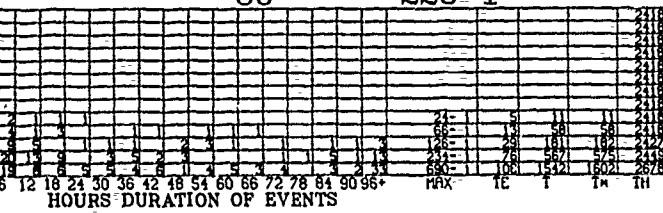
47 182-2



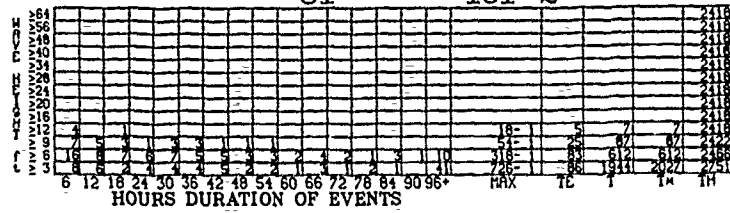
48 151-2



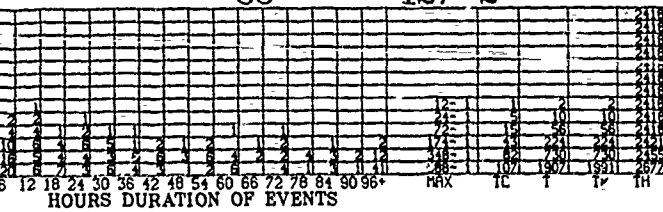
50 226-1



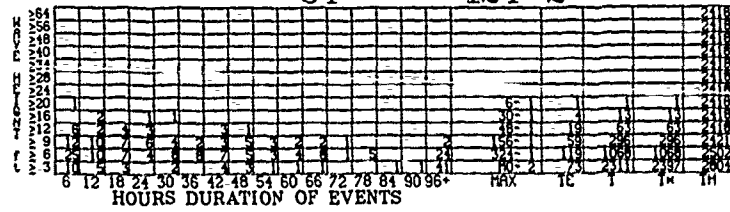
51 161-2



53 127-2



54 124-2

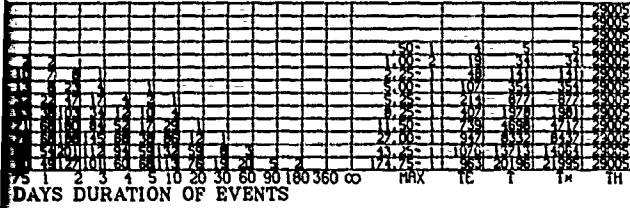




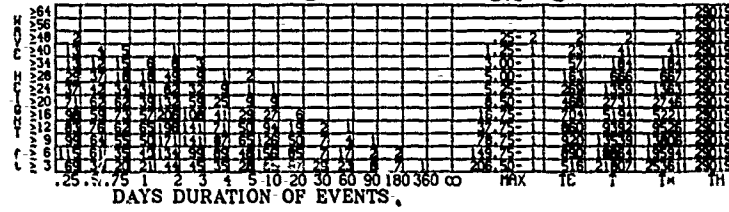


# ALL DAYS

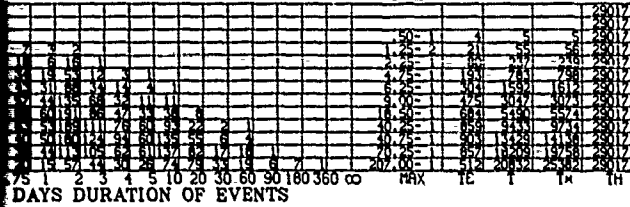
2 37-3



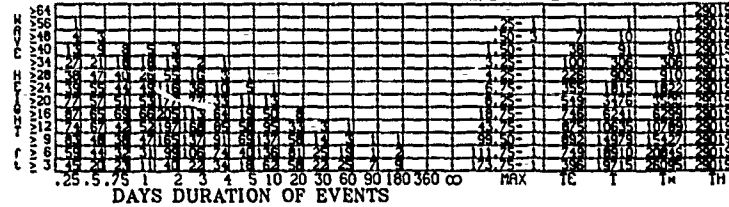
3 62-3



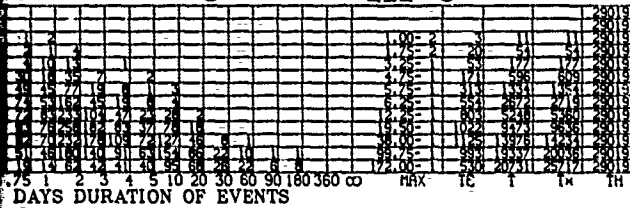
5 84-3



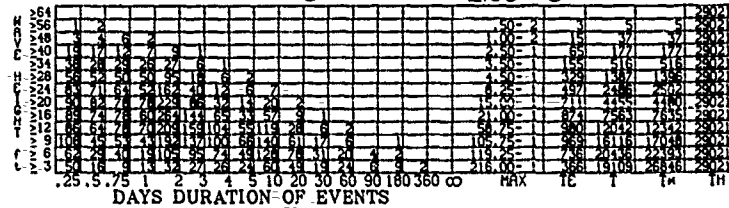
6 107-3



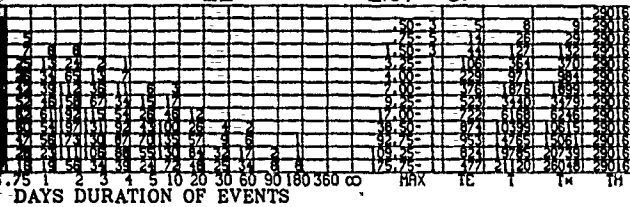
8 111-3



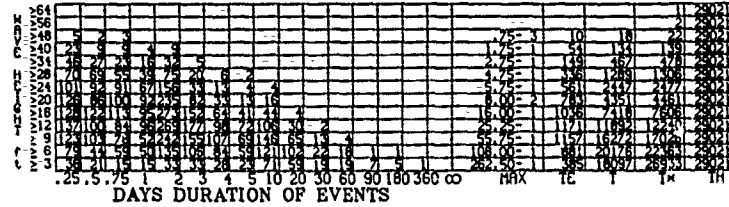
9 129-3



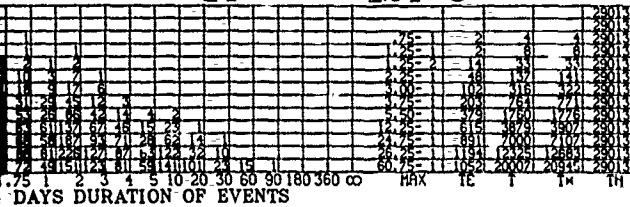
11 127-3



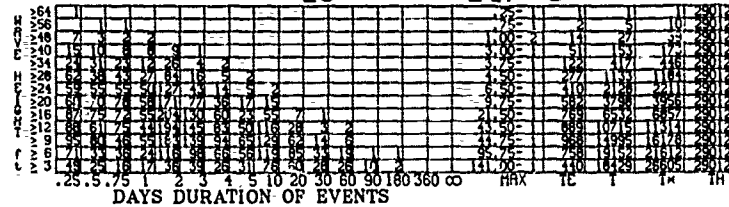
12 132-3



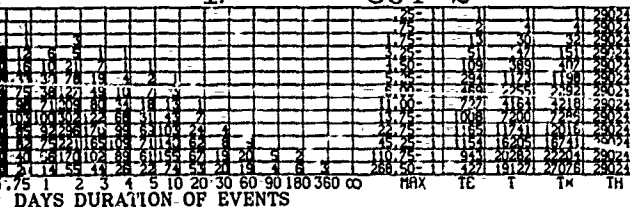
14 124-3



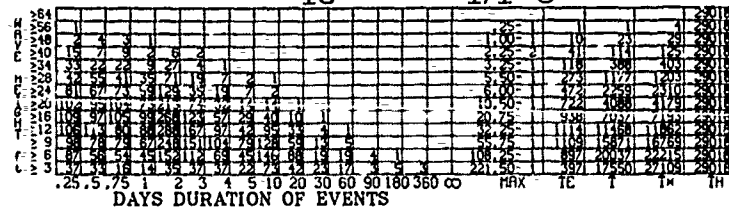
15 147-3



17 304-2



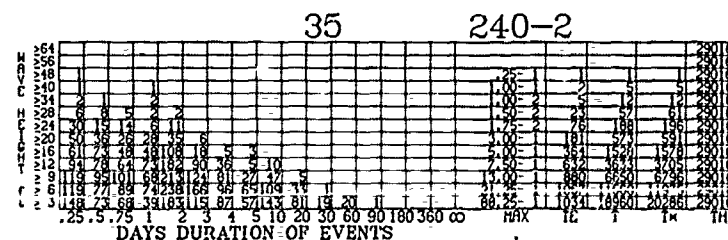
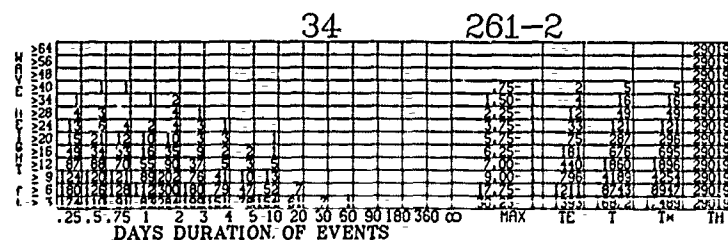
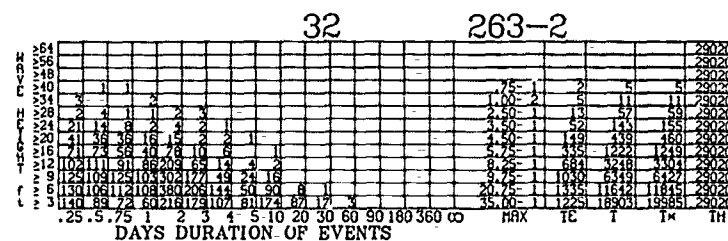
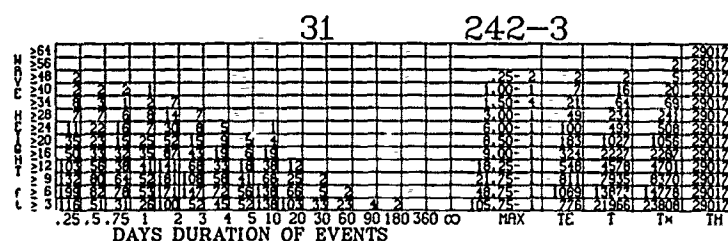
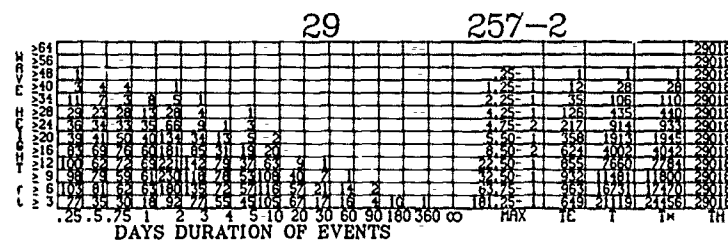
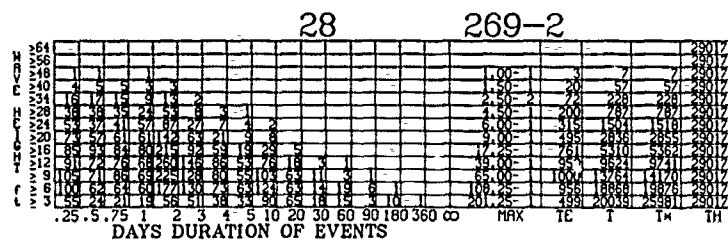
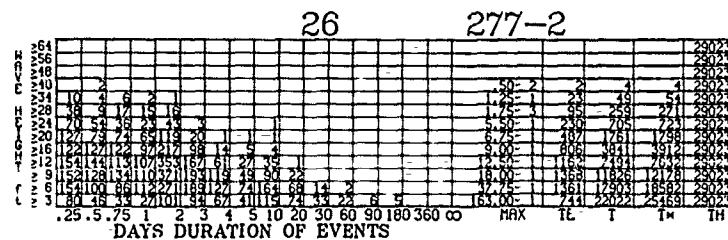
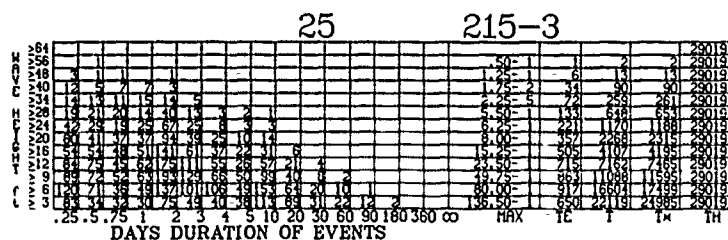
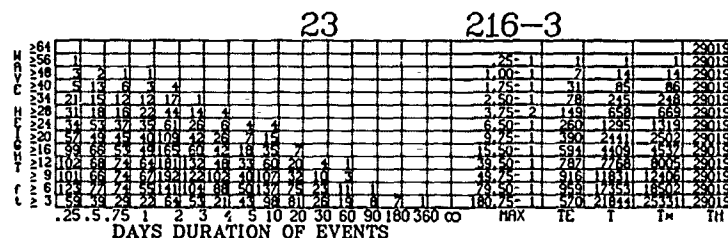
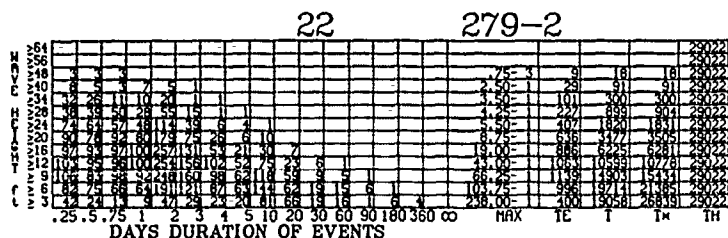
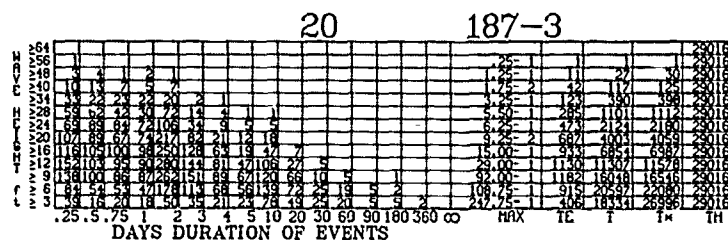
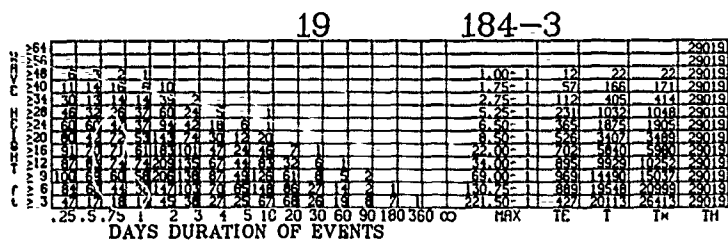
18 171-3





# ALL DAYS

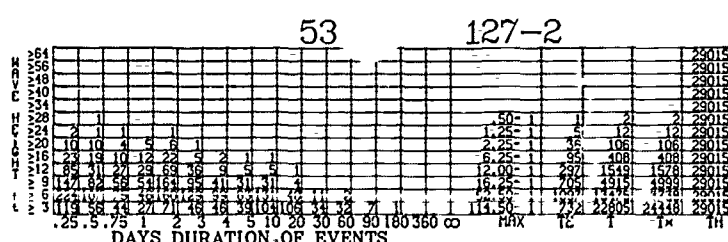
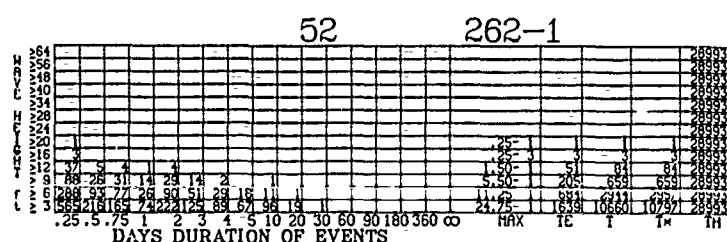
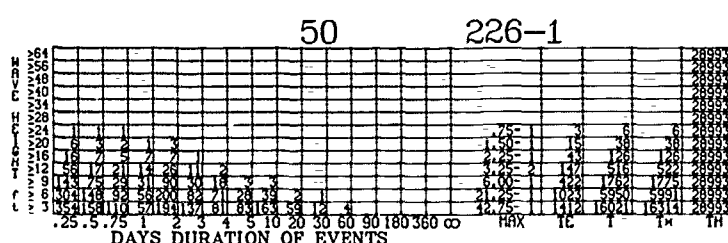
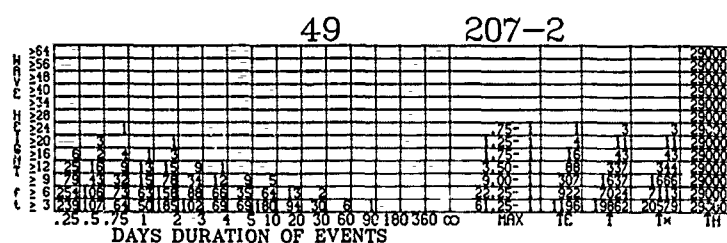
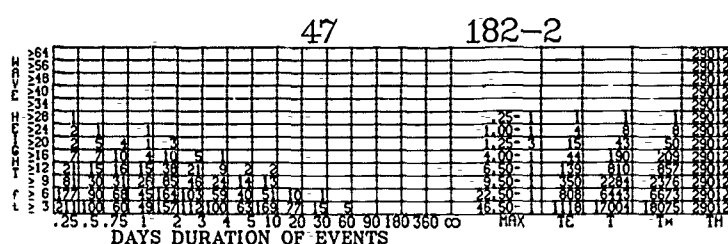
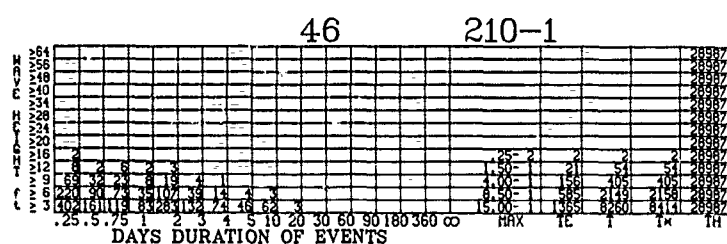
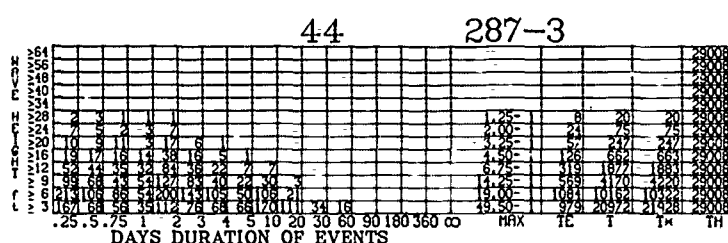
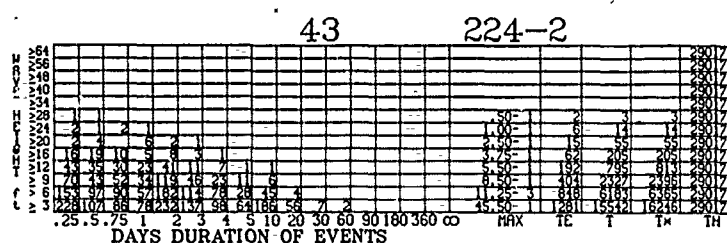
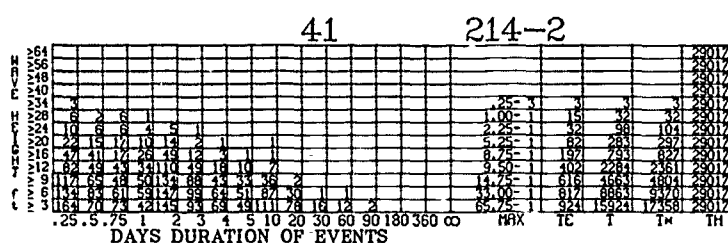
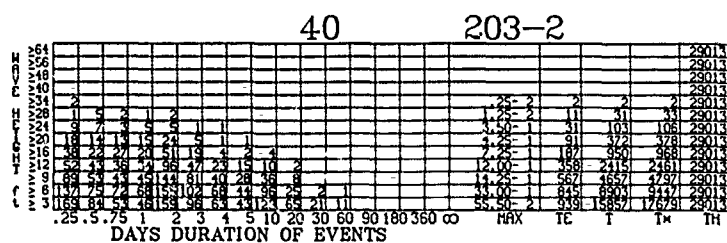
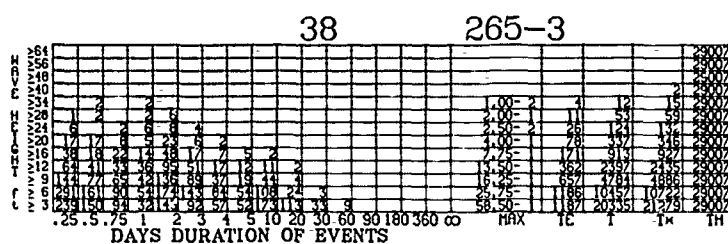
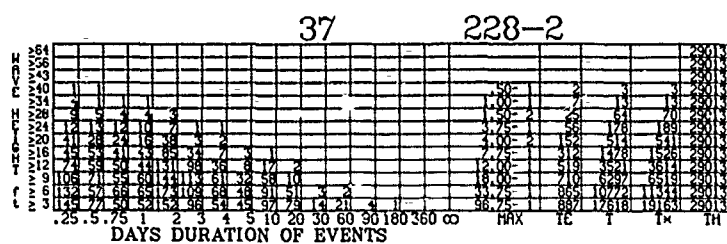
# WAVE



①



# WAVE HEIGHT DURATIONS (Cont'd)

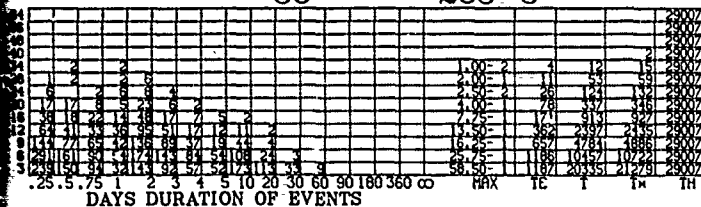


①

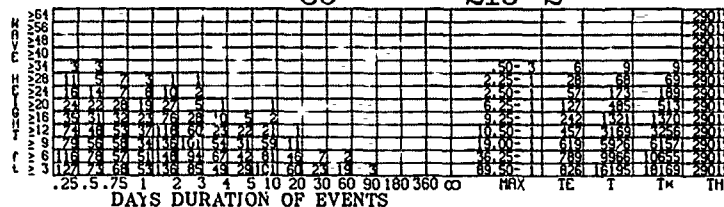
nt'd)

# ALL DAYS

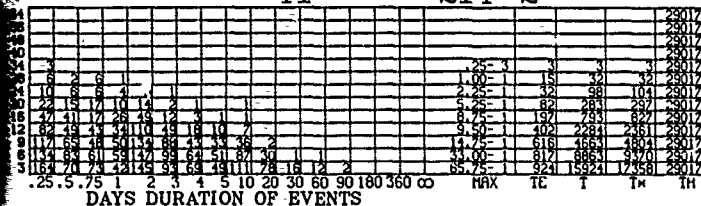
38 265-3



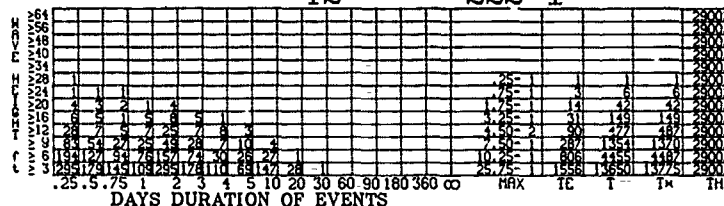
39 216-2



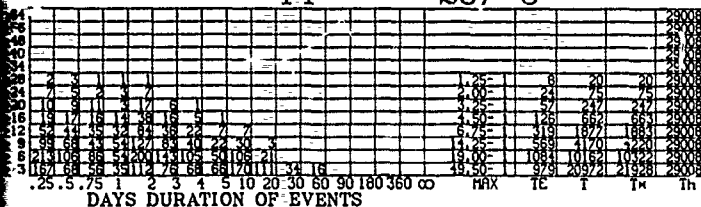
41 214-2



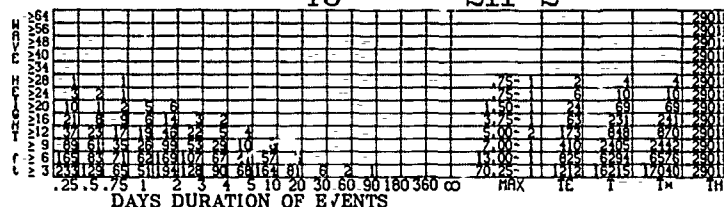
42 222-1



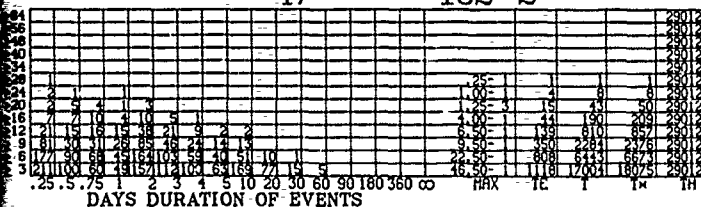
44 287-3



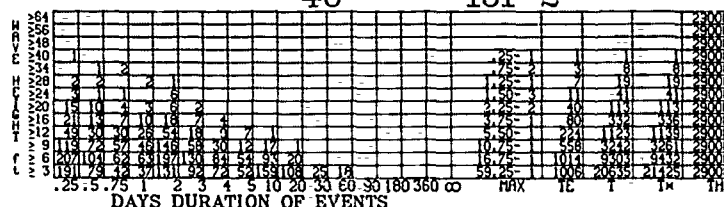
45 211-2



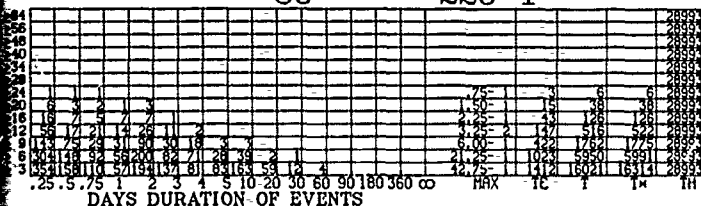
47 182-2



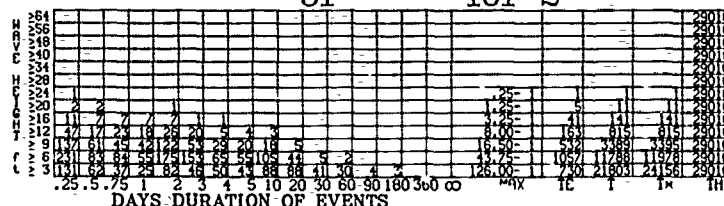
48 151-2



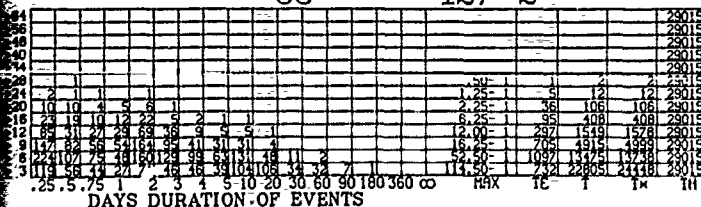
50 226-1



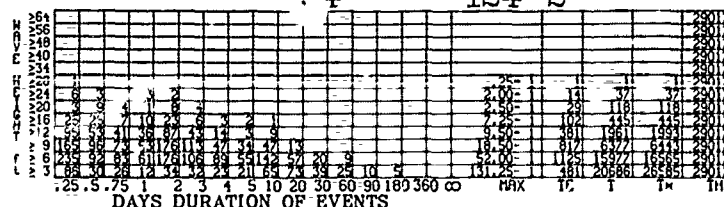
51 161-2



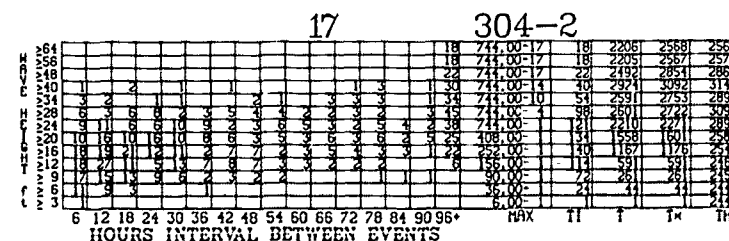
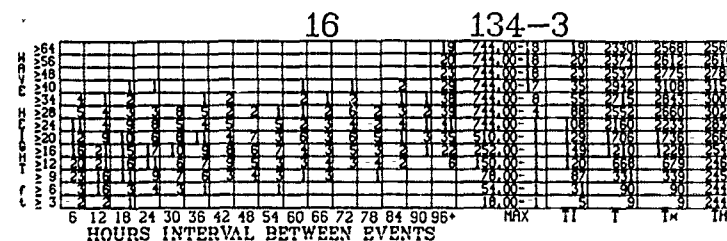
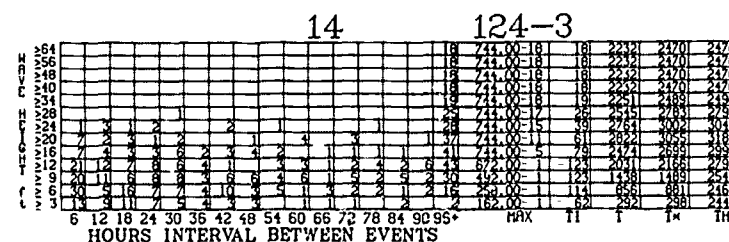
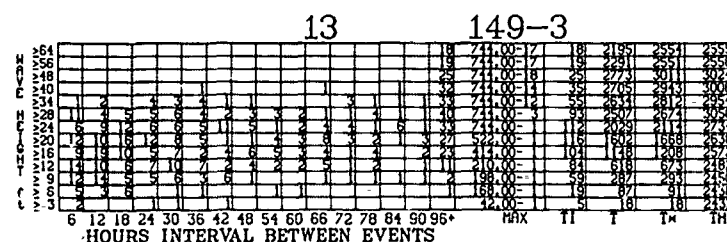
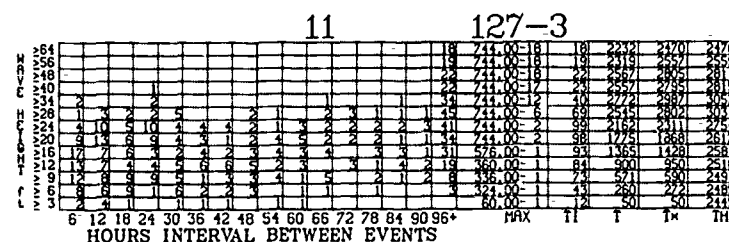
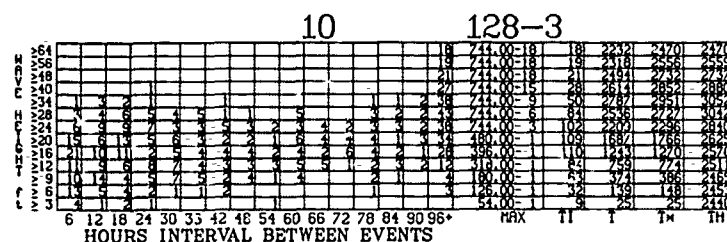
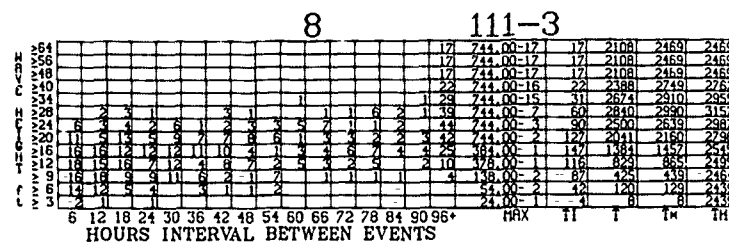
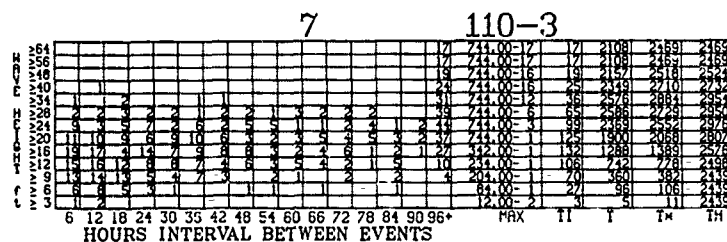
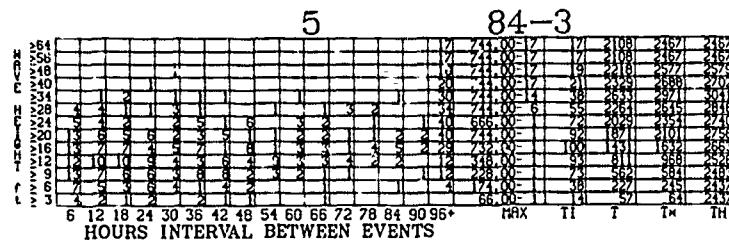
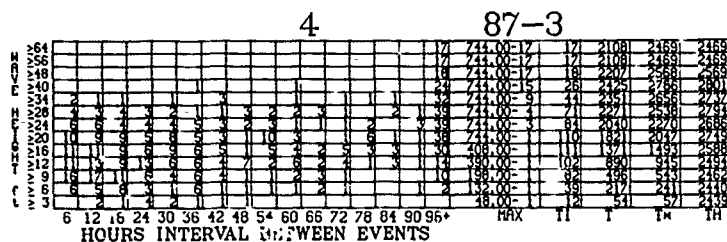
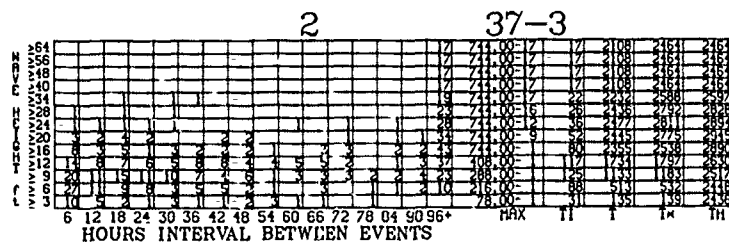
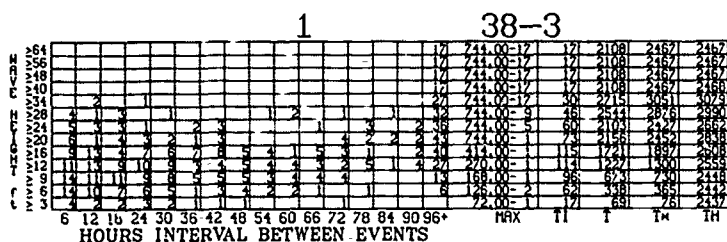
53 127-2



54 124-2

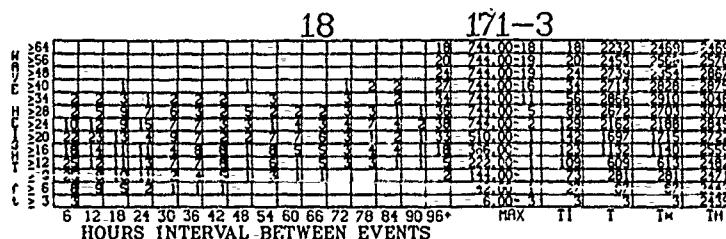
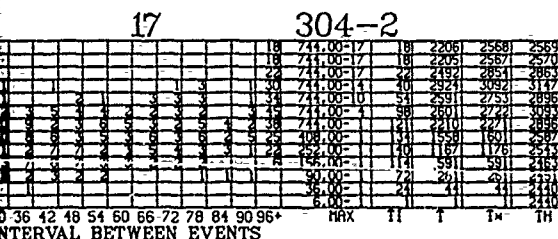
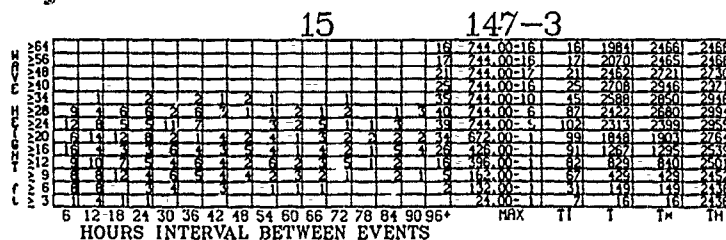
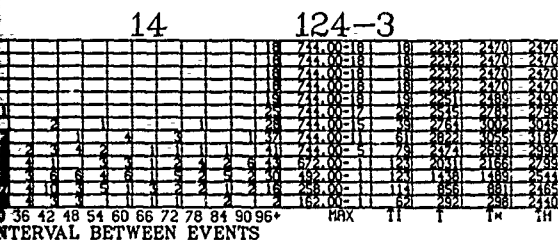
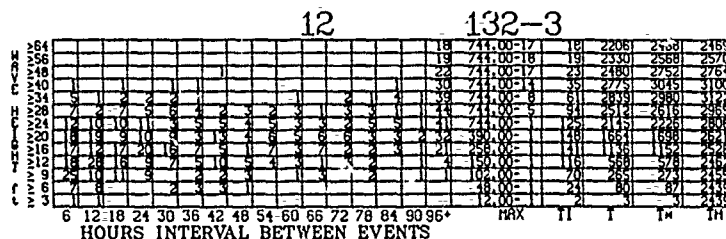
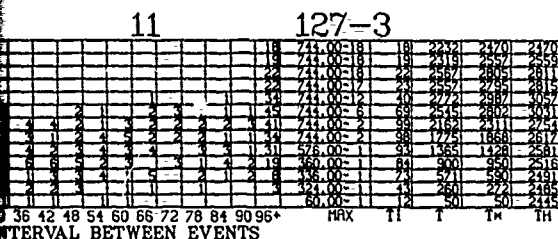
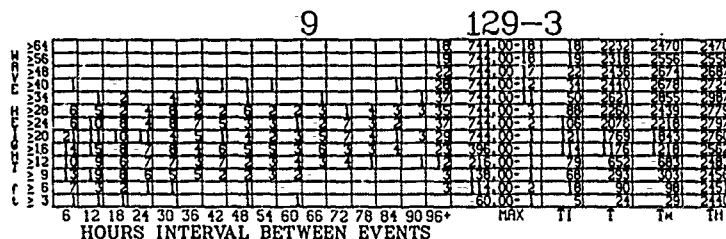
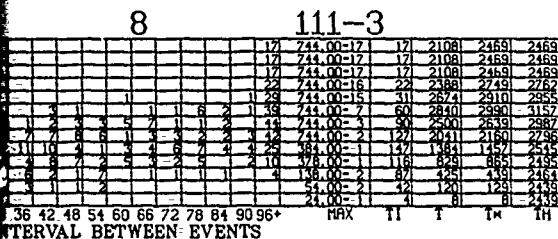
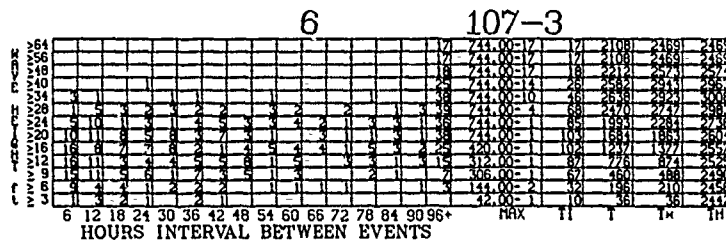
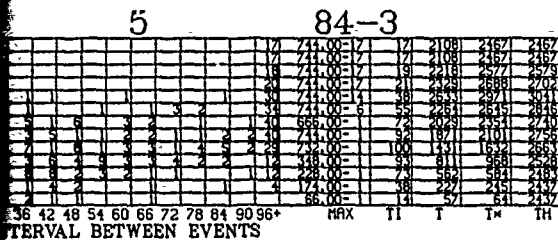
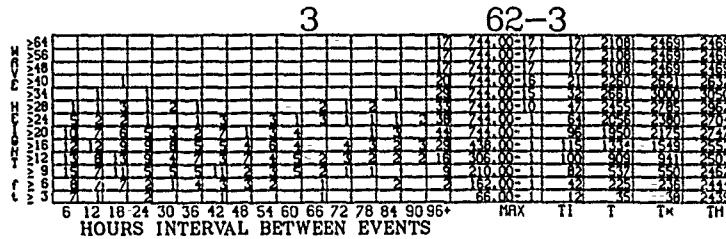
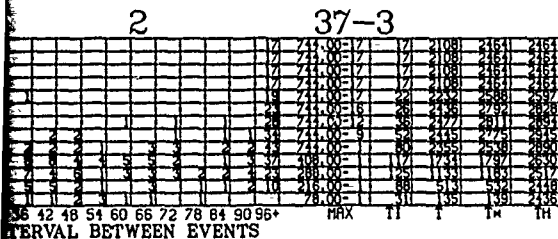


# JANUARY



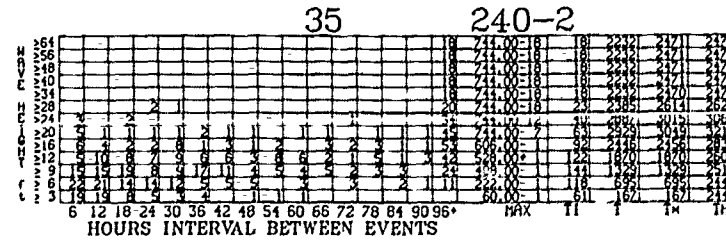
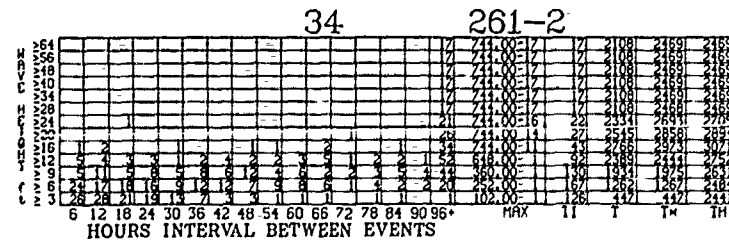
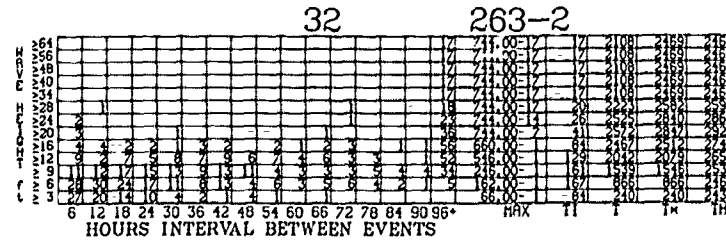
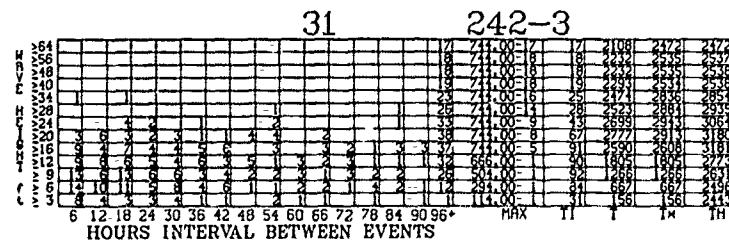
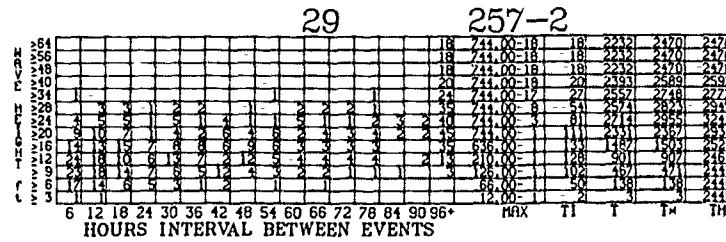
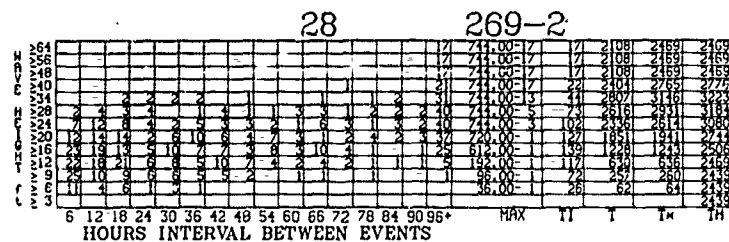
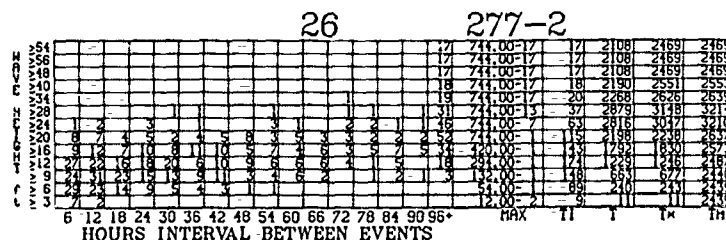
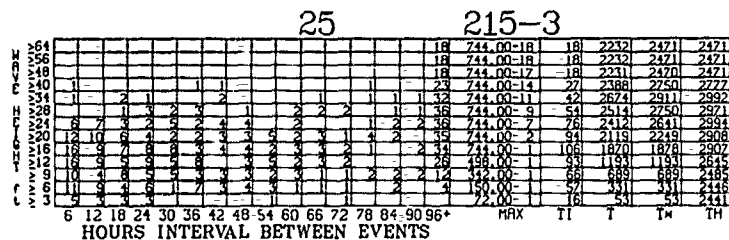
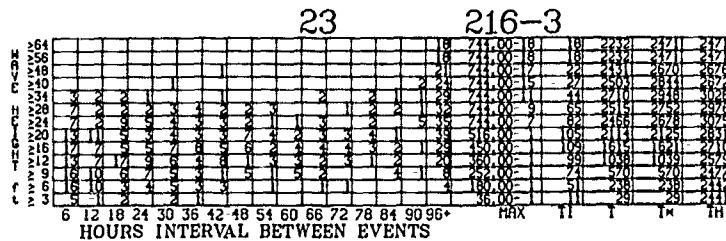
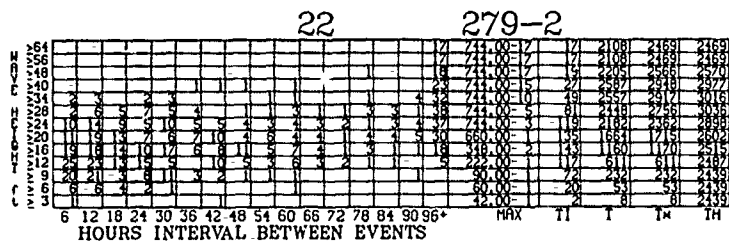
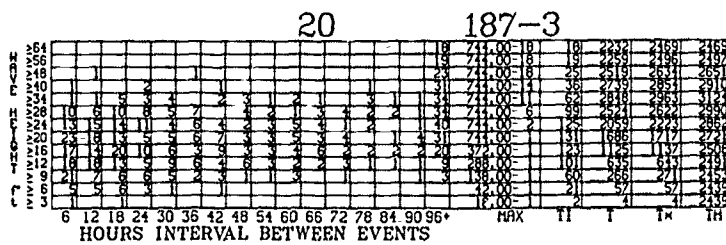
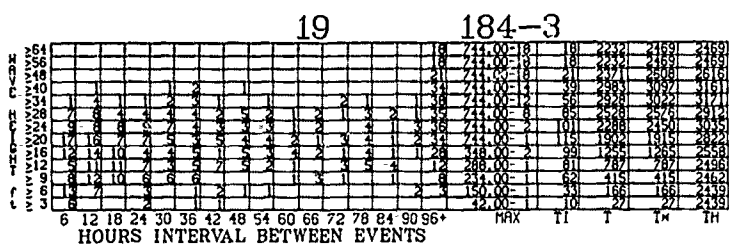


# WAVE HEIGHT INTERVALS



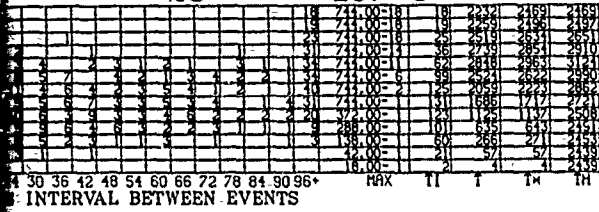


# WAVE HEIGHT INTERVALS (Cont'd)

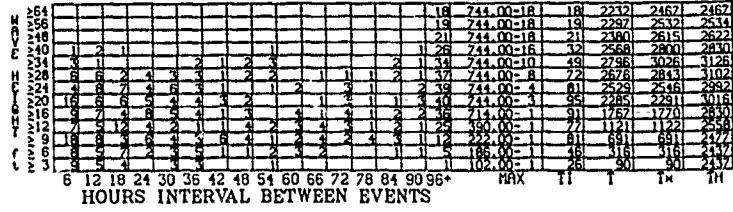


# JANUARY

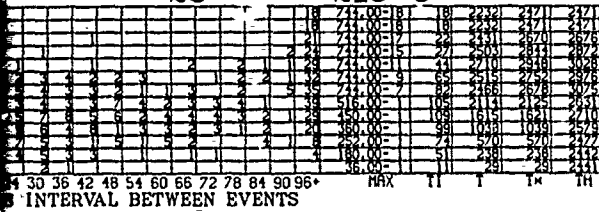
20 187-3



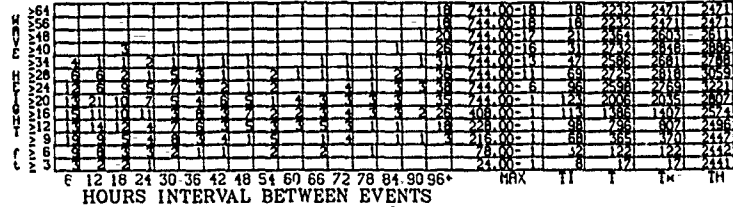
21 182-3



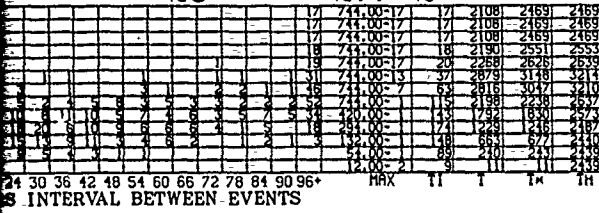
23 216-3



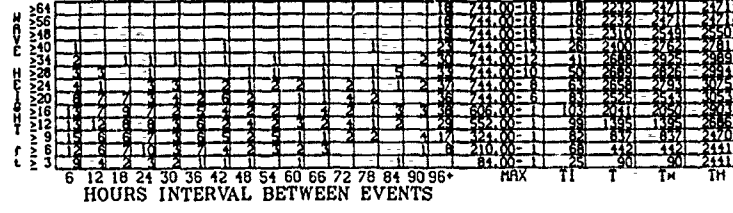
24 218-3



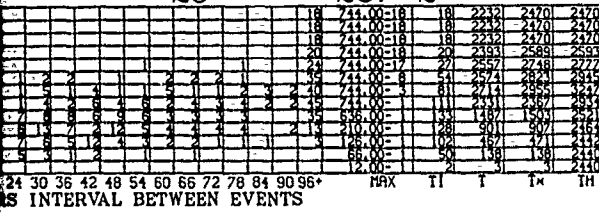
26 277-2



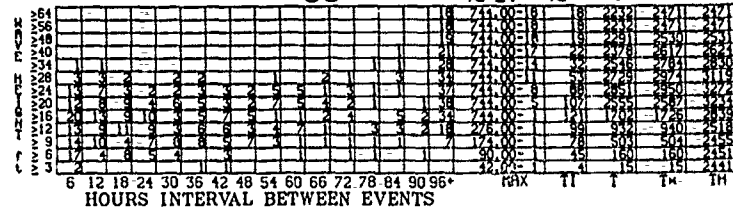
27 214-3



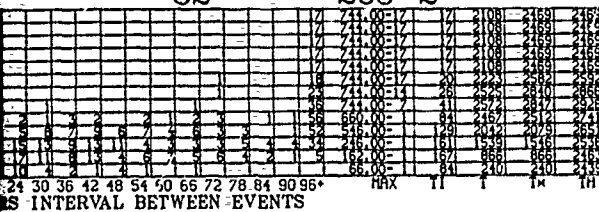
29 257-2



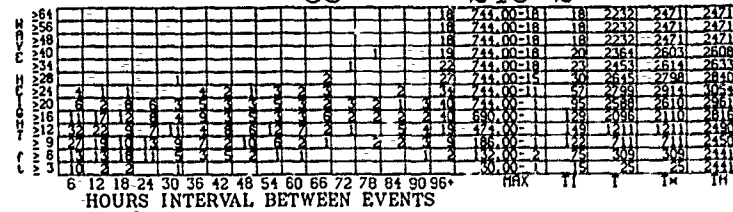
30 247-2



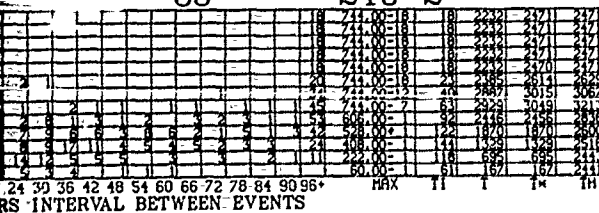
32 263-2



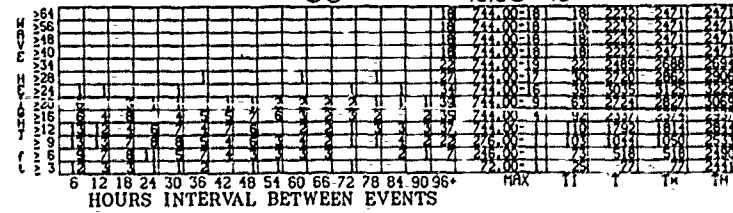
33 243-2



35 240-2

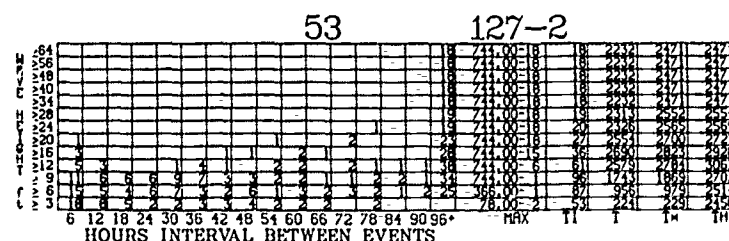
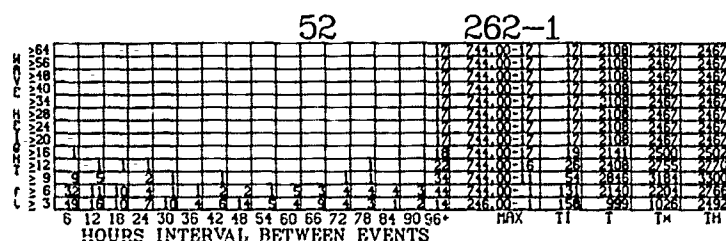
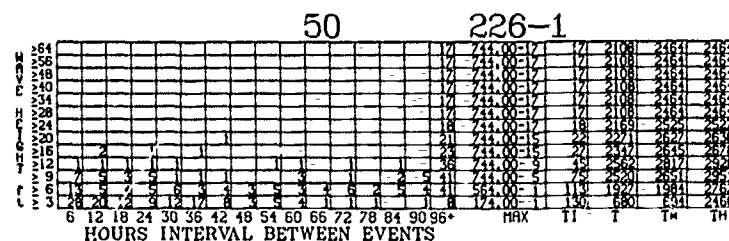
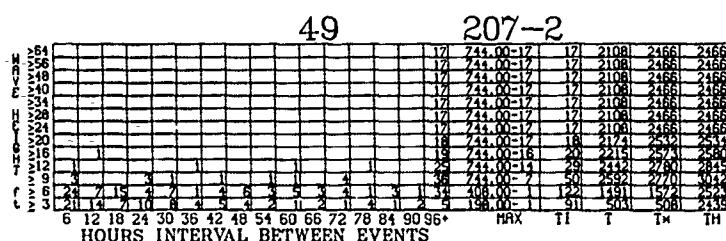
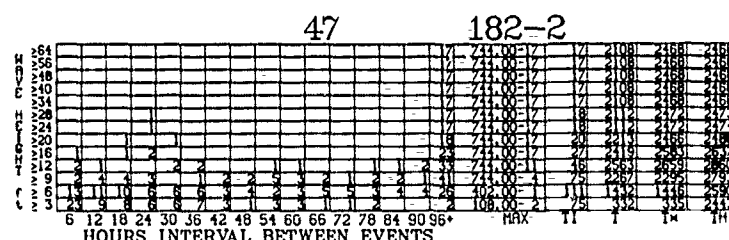
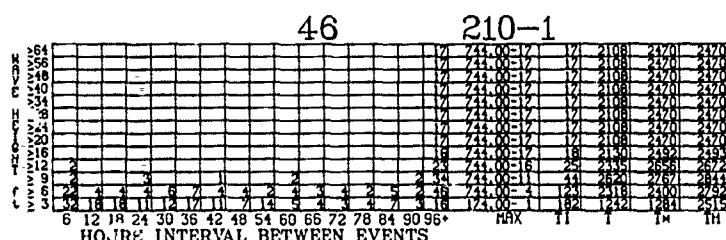
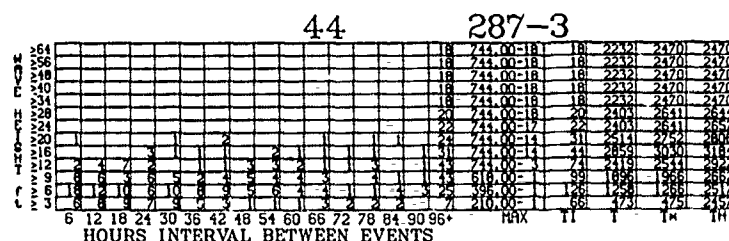
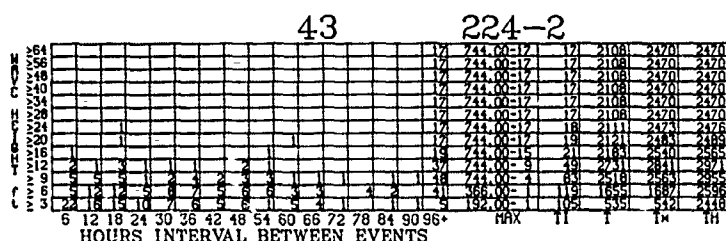
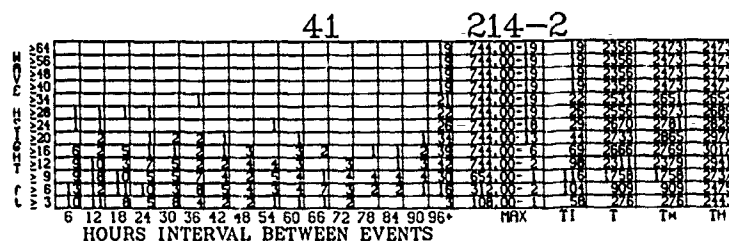
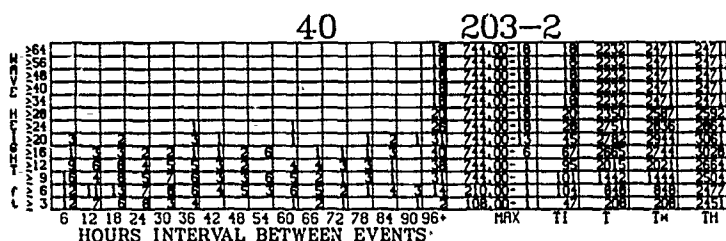
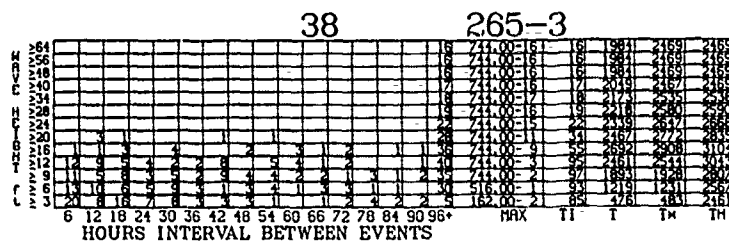
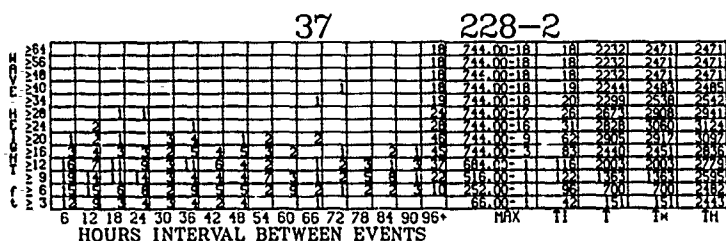


36 220-2



# JANUARY

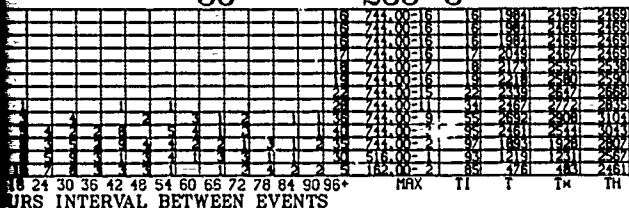
# WAVE



# WAVE HEIGHT INTERVALS (Cont'd)

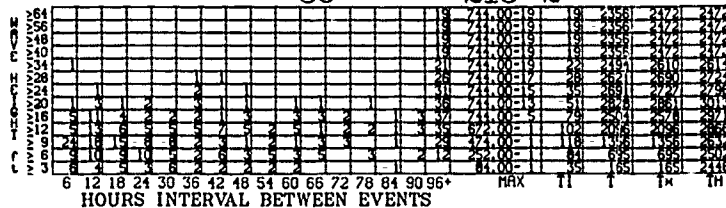
38

265-3



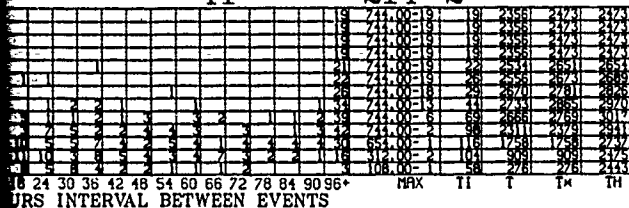
39

216-2



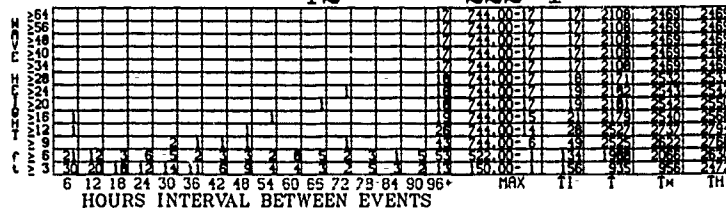
41

214-2



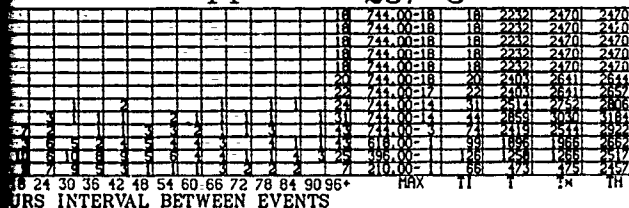
42

222-1



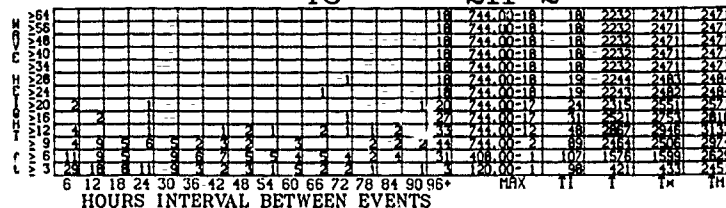
44

287-3



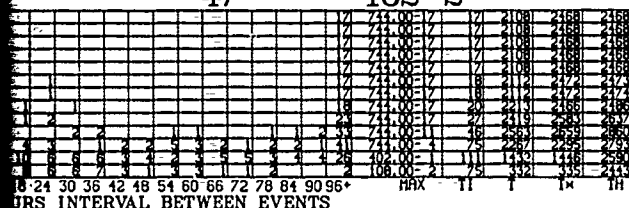
45

211-2



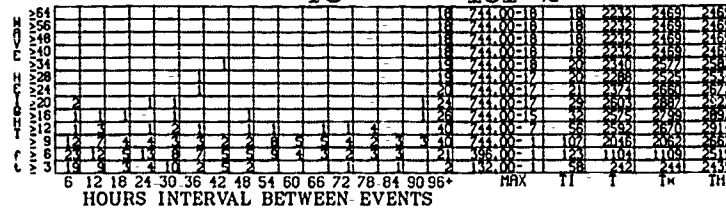
47

182-2



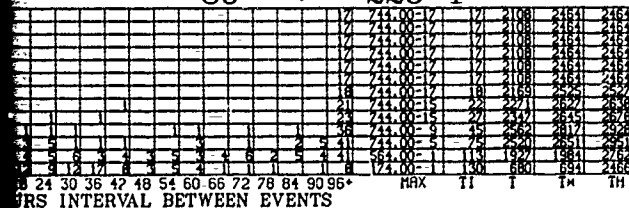
48

151-2



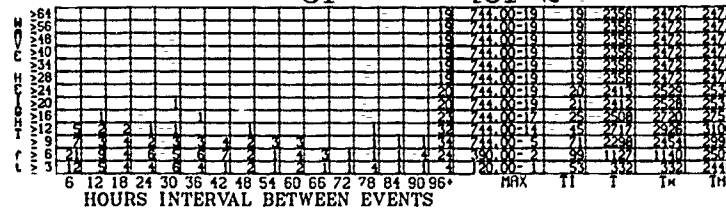
50

226-1



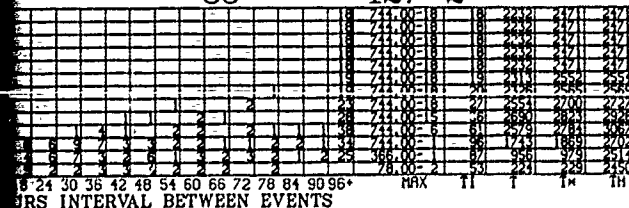
51

161-2



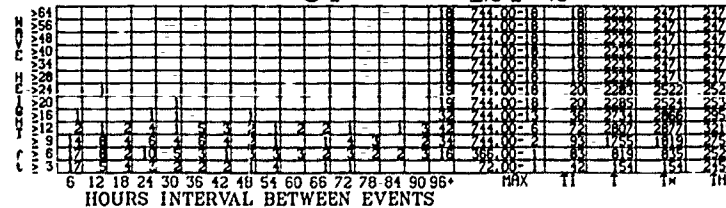
53

127-2

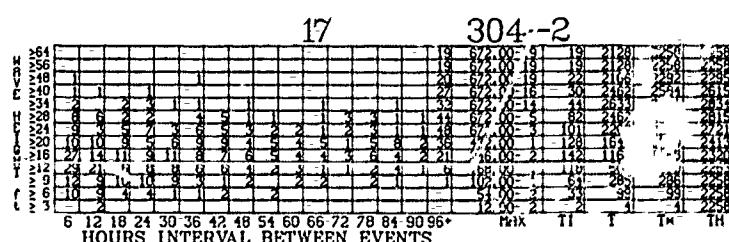
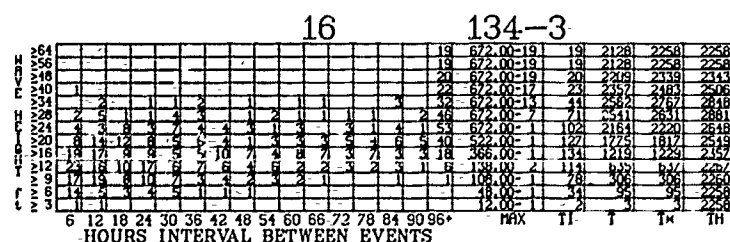
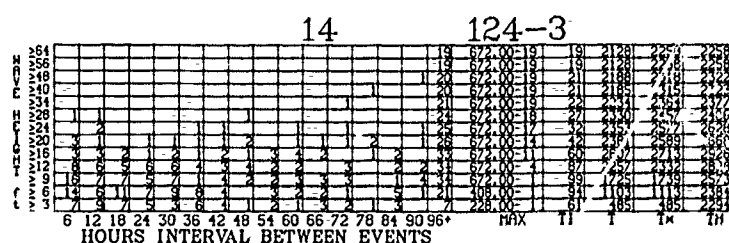
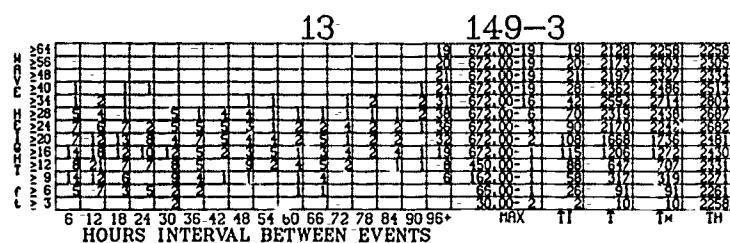
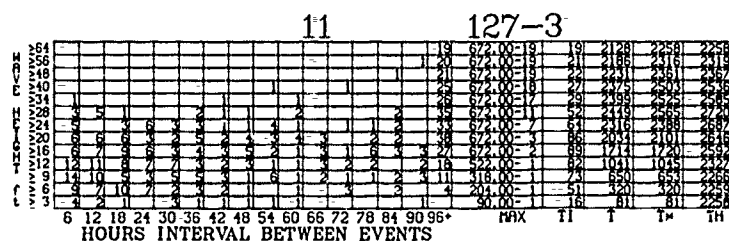
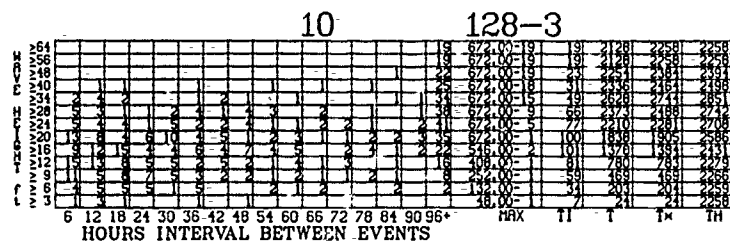
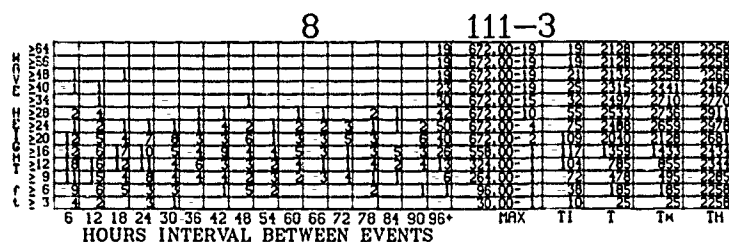
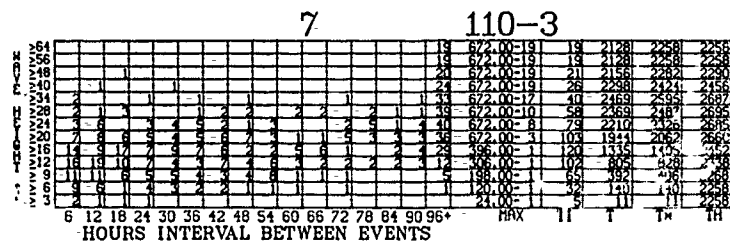
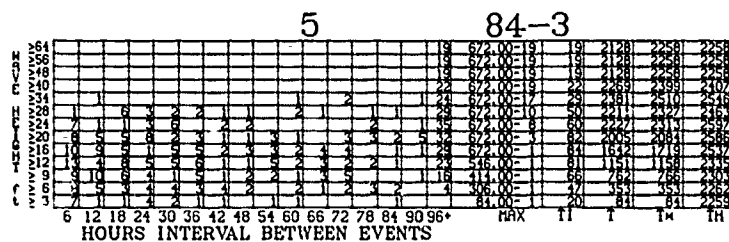
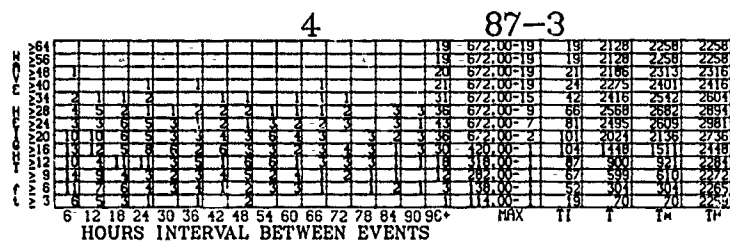
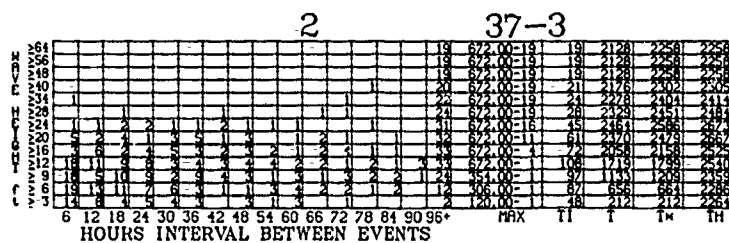
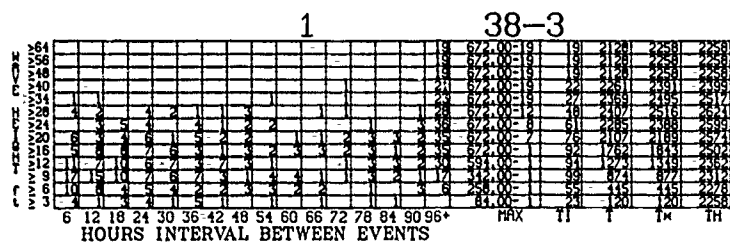


54

124-2



# WAVE HEIGHT INTERVALS

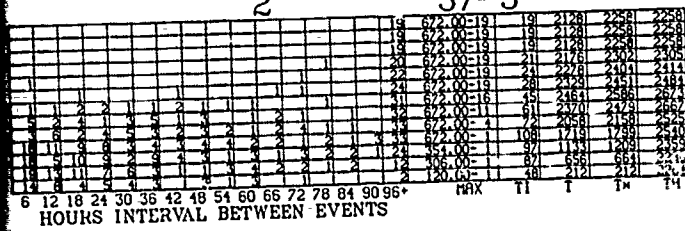




# FEBRUARY

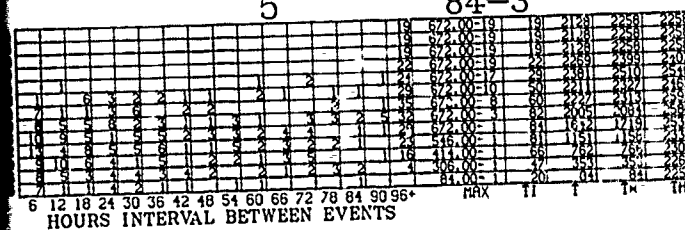
2

37-3



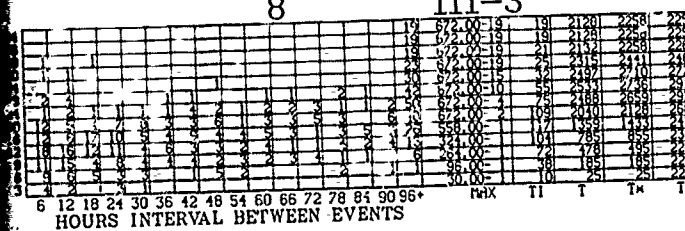
5

84-3



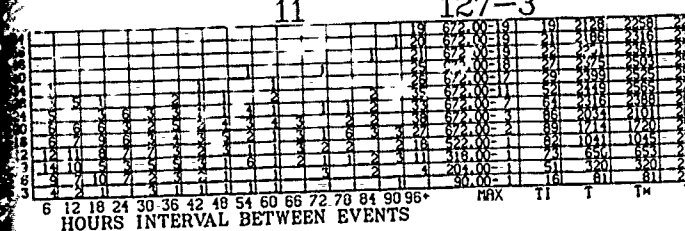
8

111-3



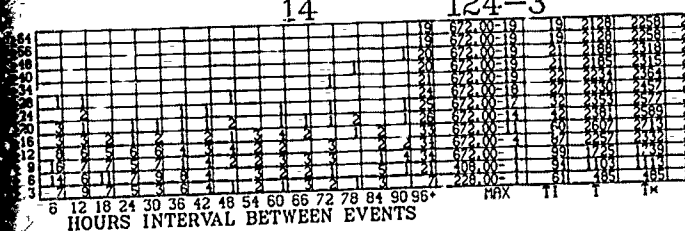
11

127-3



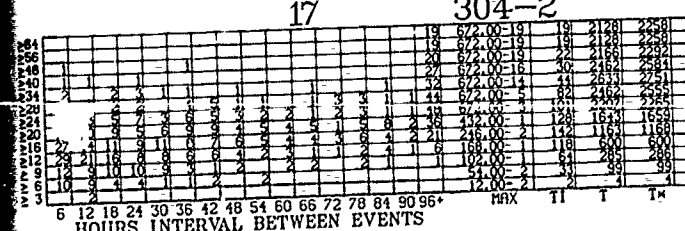
14

124-3



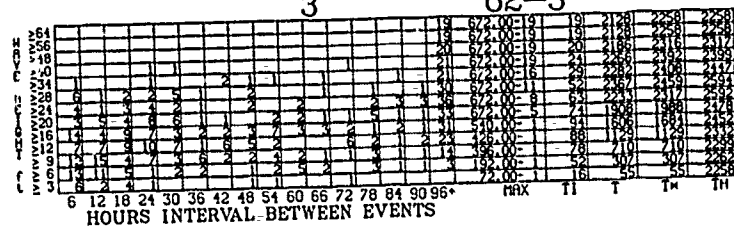
17

304-2



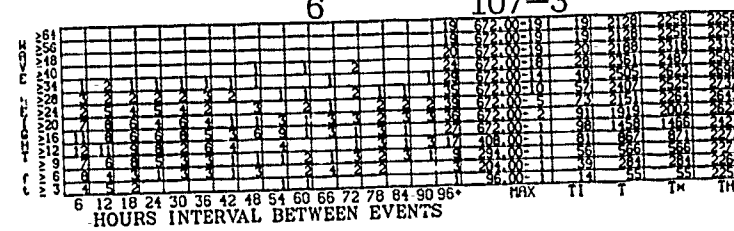
3

62-3



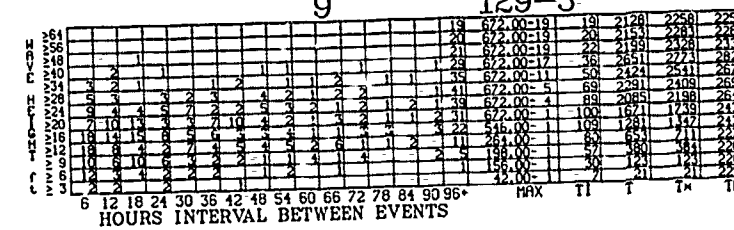
6

107-3



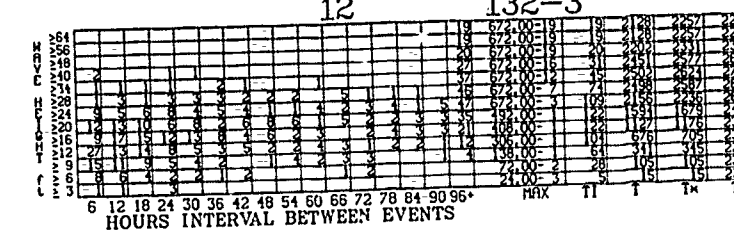
9

129-3



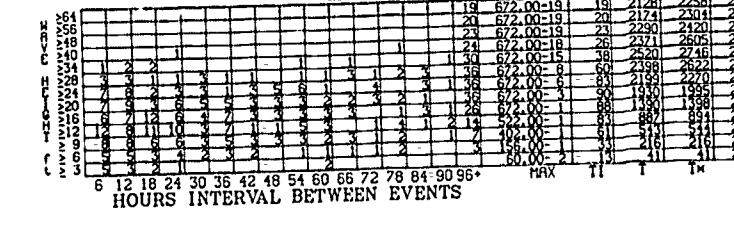
12

132-3



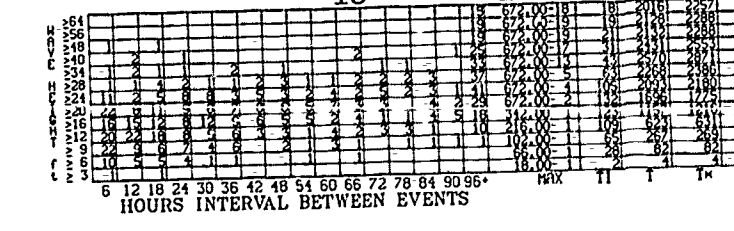
15

147-3



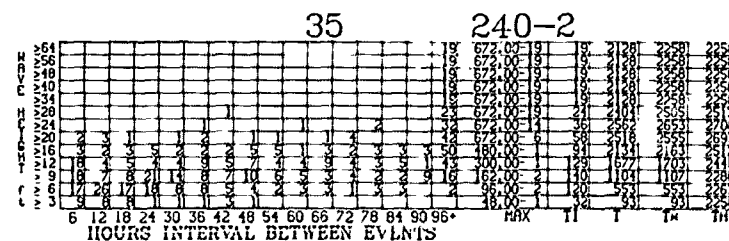
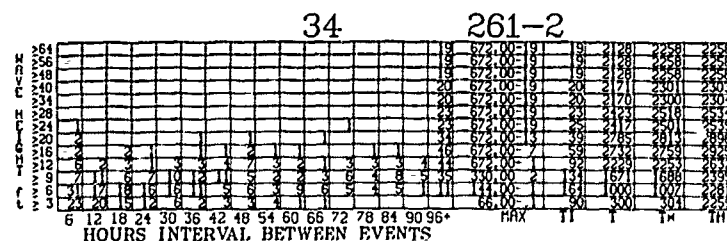
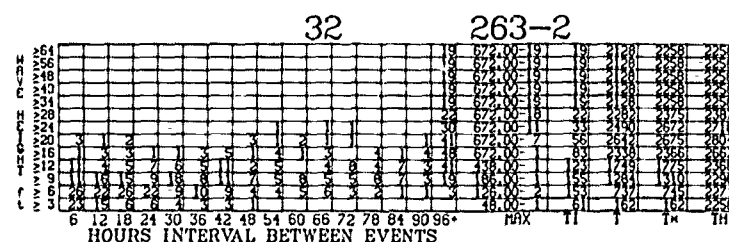
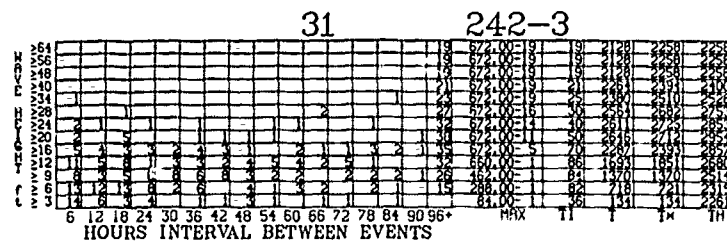
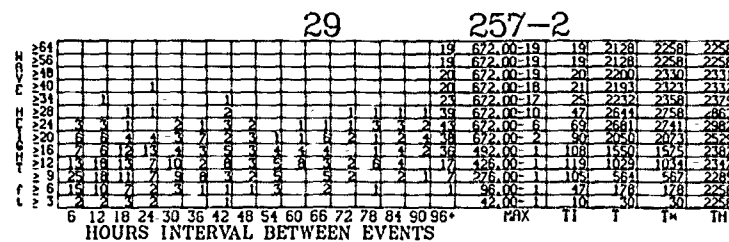
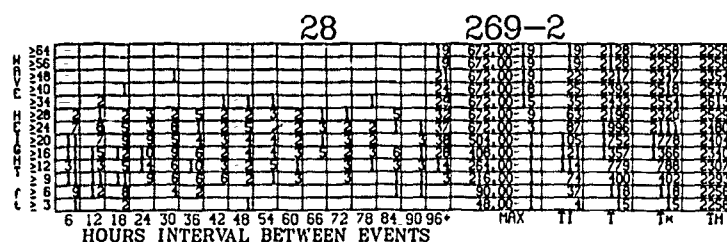
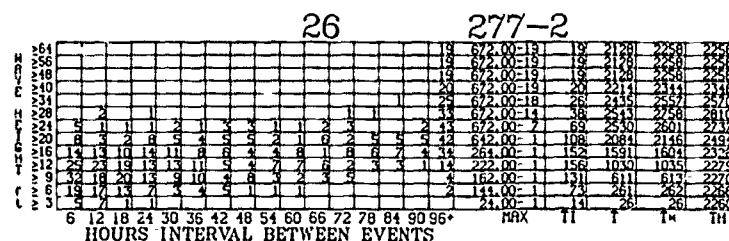
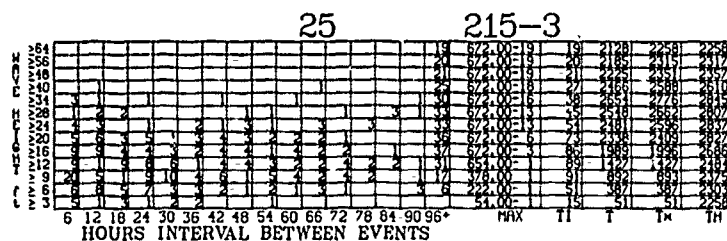
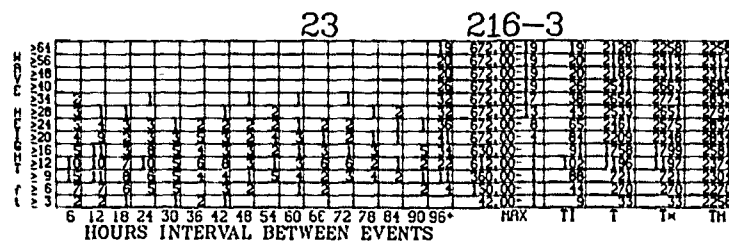
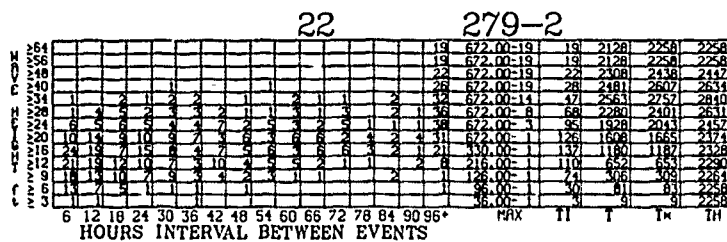
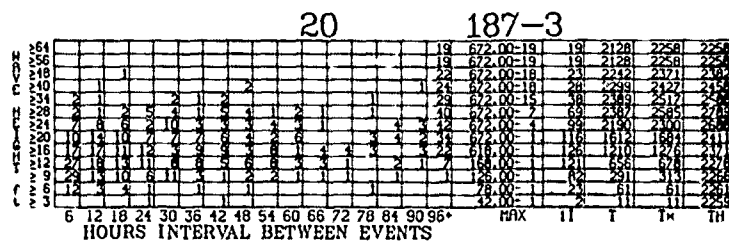
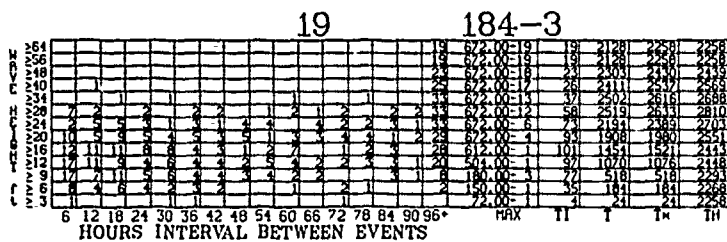
18

171-3



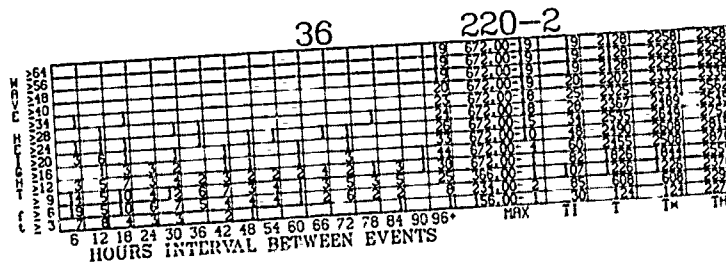
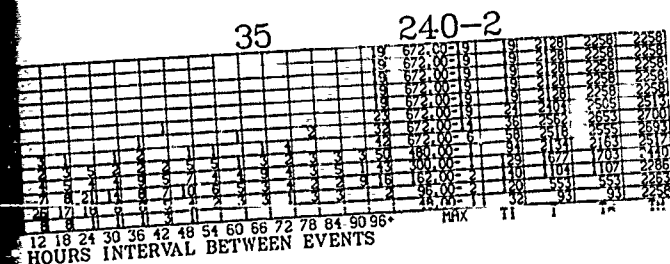
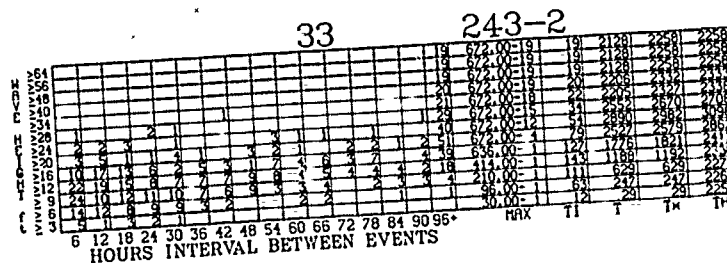
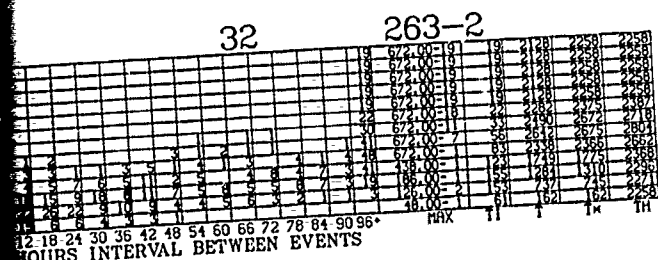
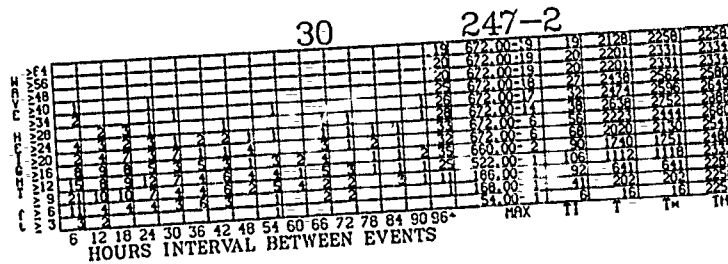
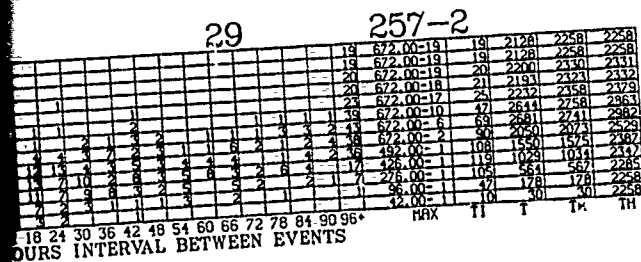
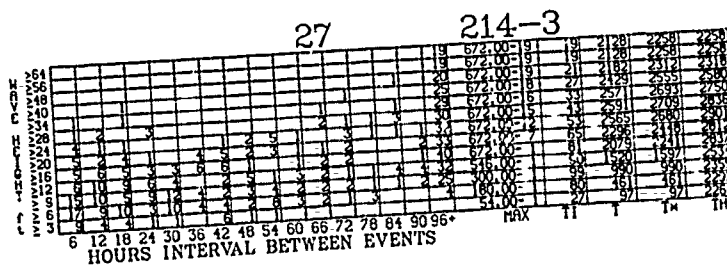
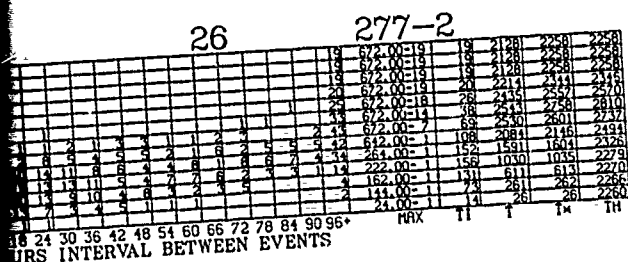
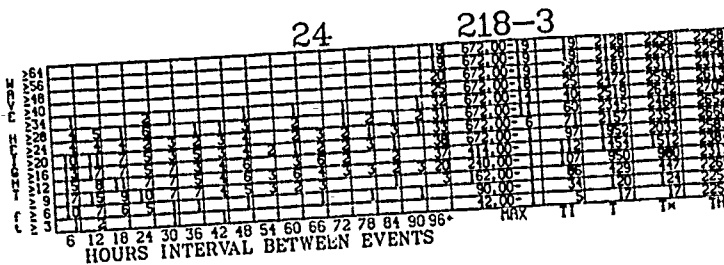
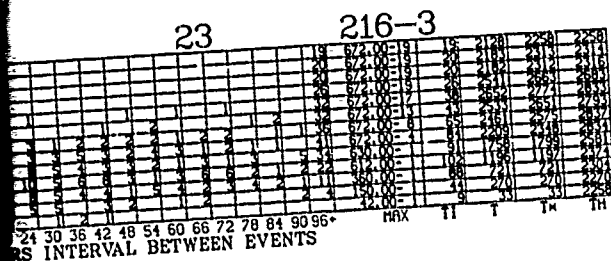
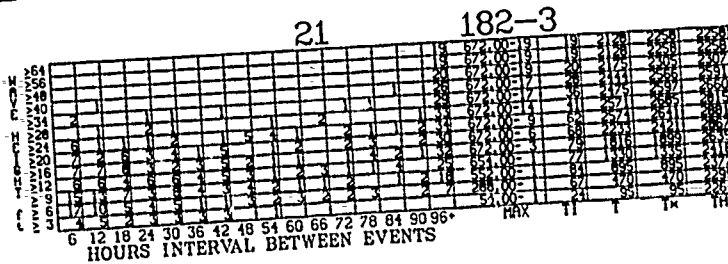
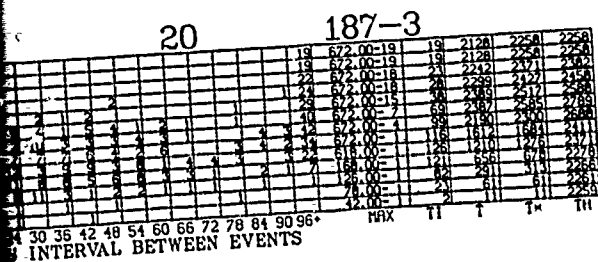
2



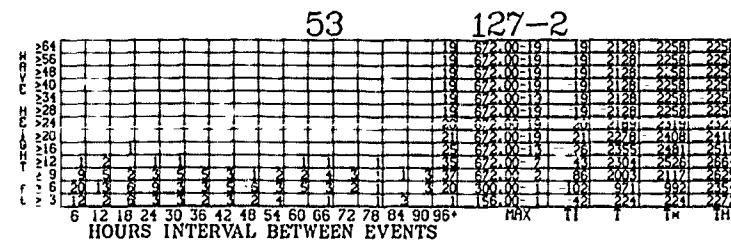
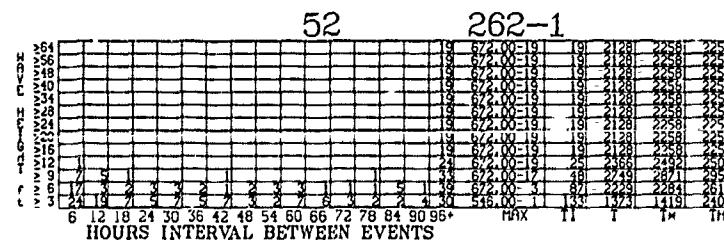
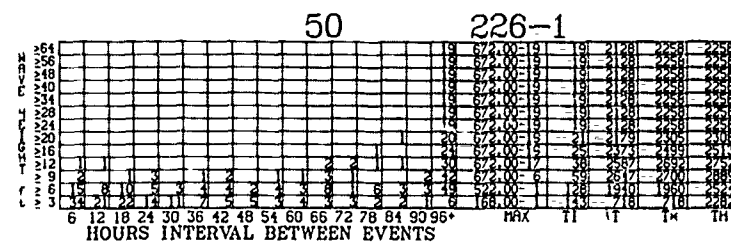
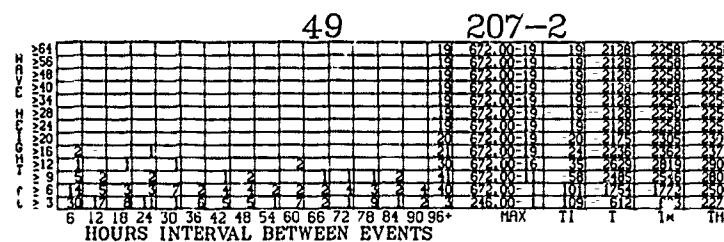
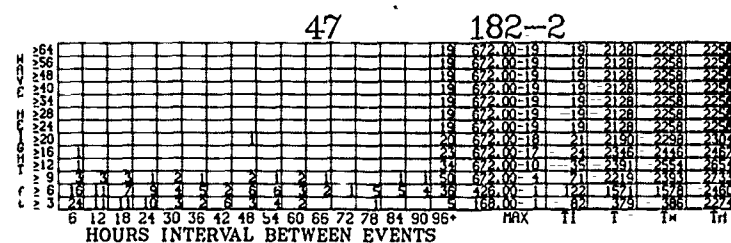
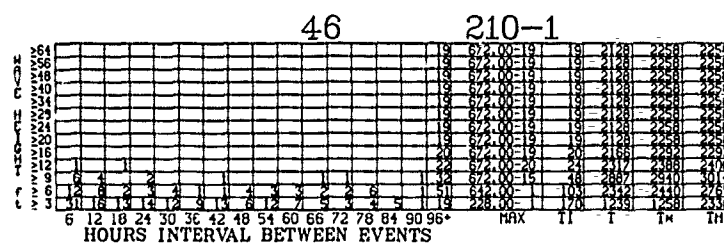
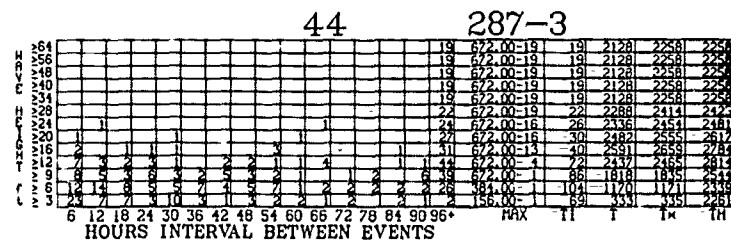
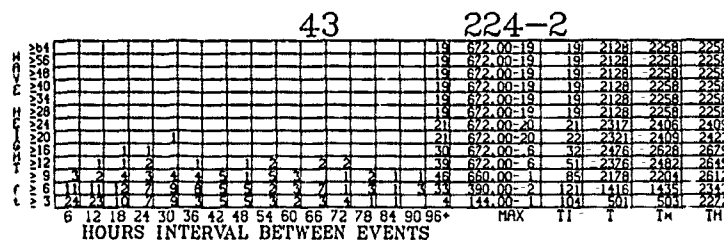
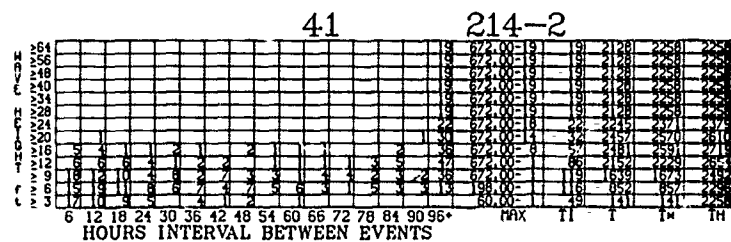
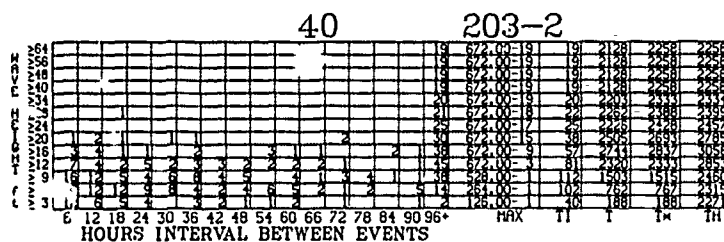
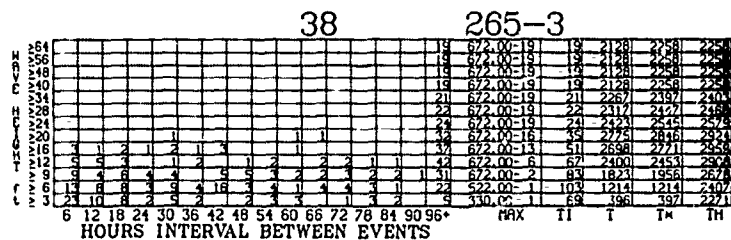
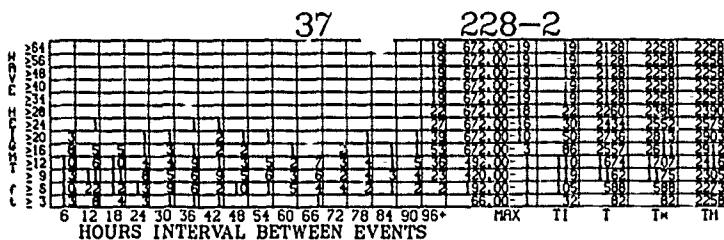


①

# WAVE HEIGHT INTERVALS (Cont'd)



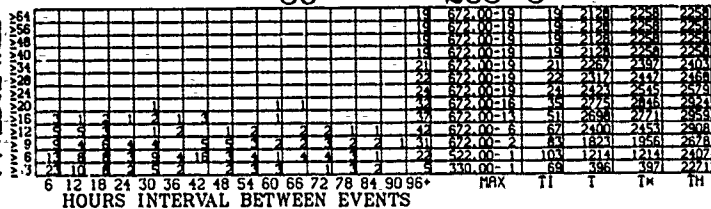
# WAVE HEIGHT INTERVALS (Cont'd)



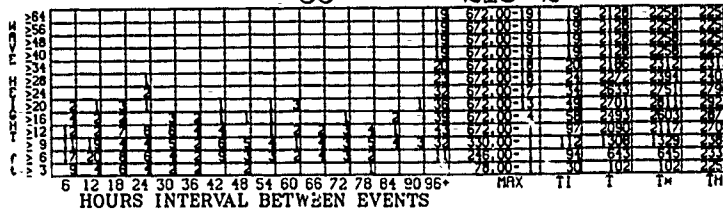
nt'd)

# FEBRUARY

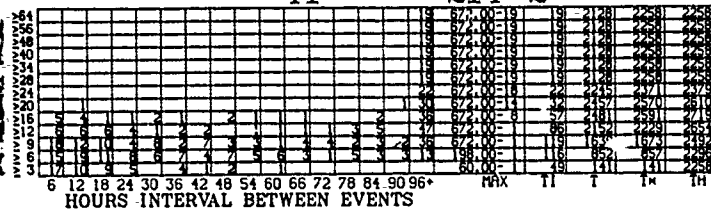
38 265-3



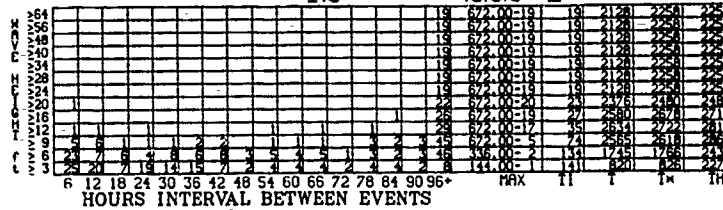
39 216-2



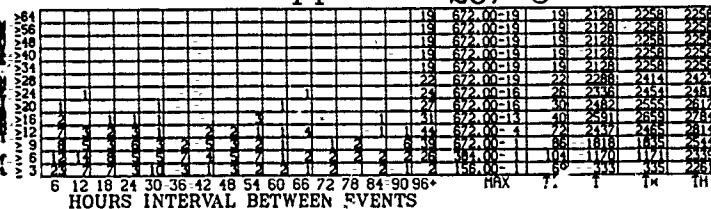
41 214-2



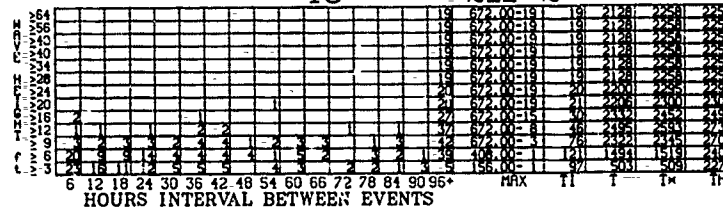
42 222-1



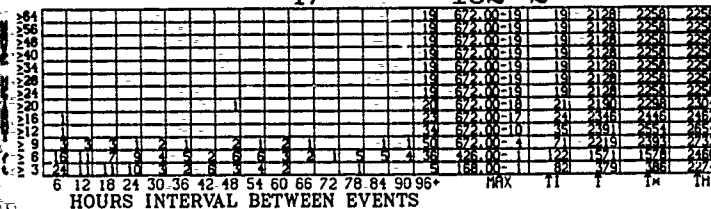
44 287-3



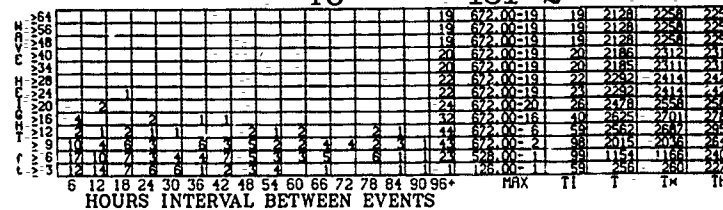
45 211-2



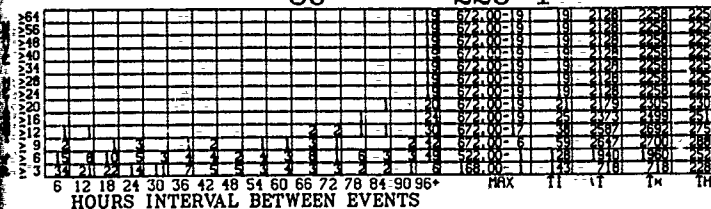
47 182-2



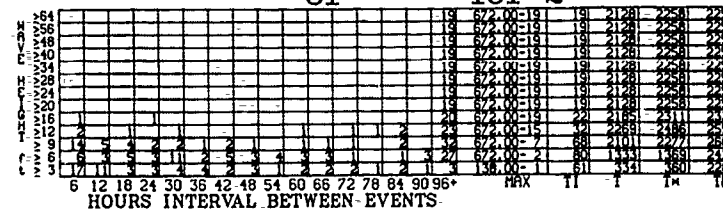
48 151-2



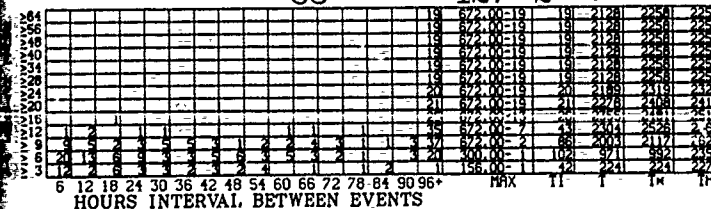
50 226-1



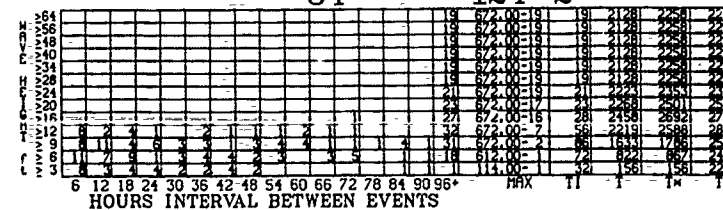
51 161-2



53 127-2

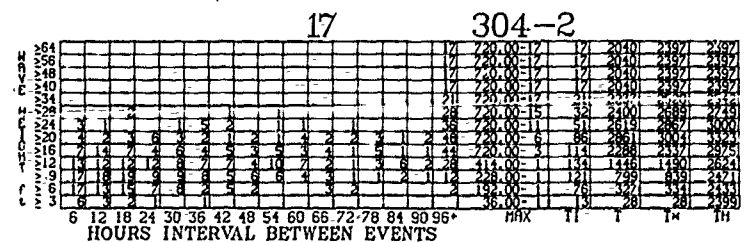
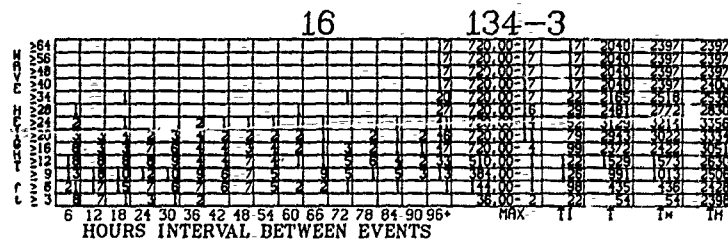
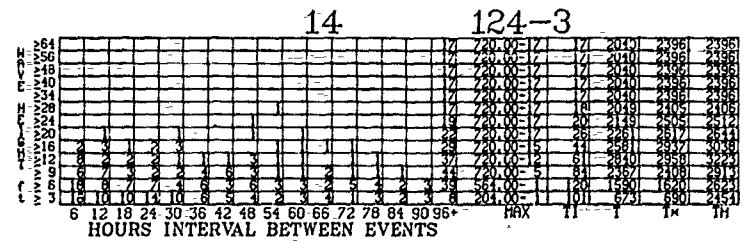
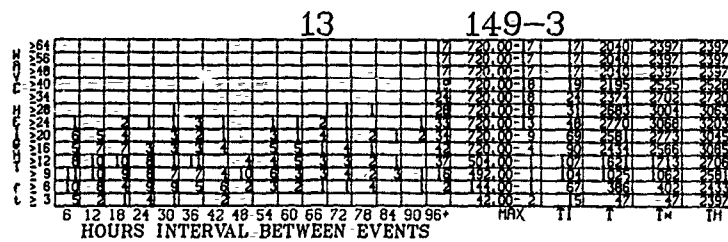
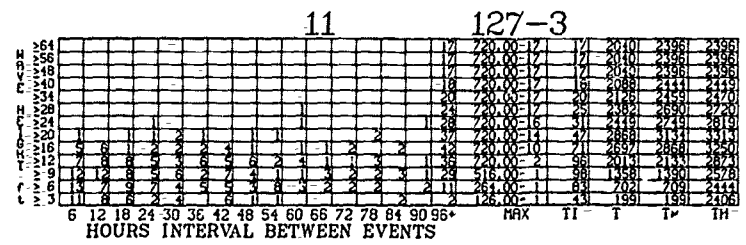
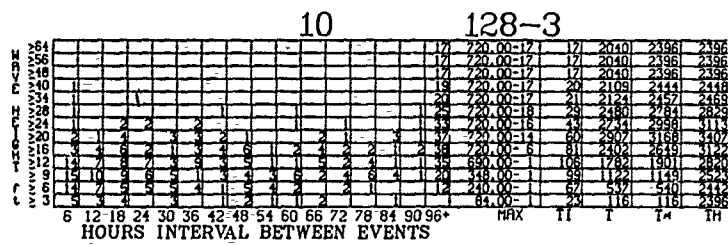
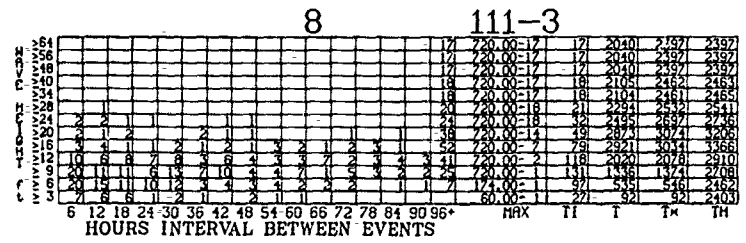
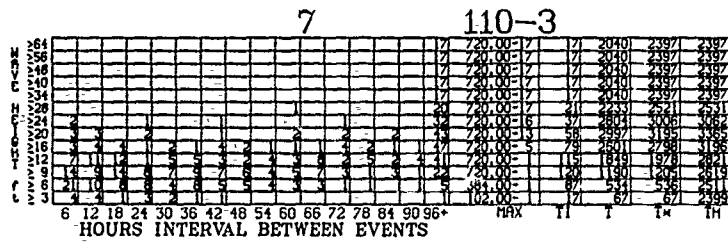
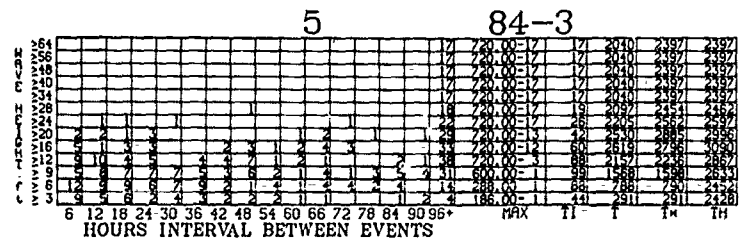
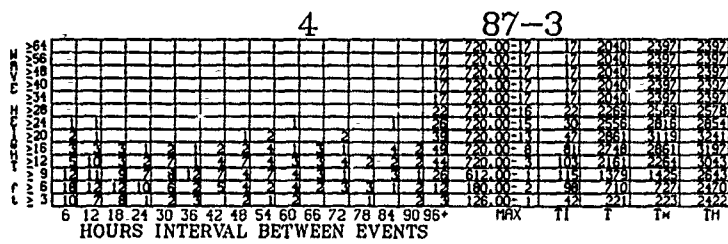
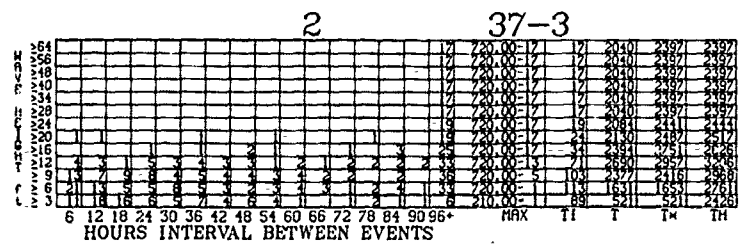
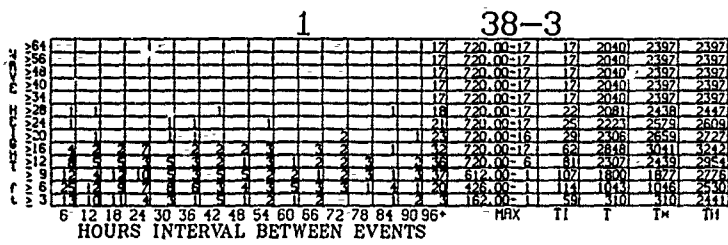


54 124-2



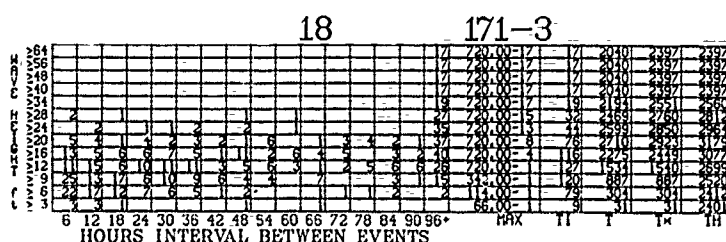
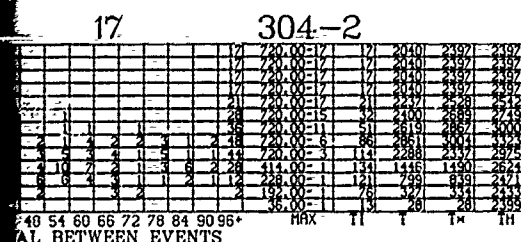
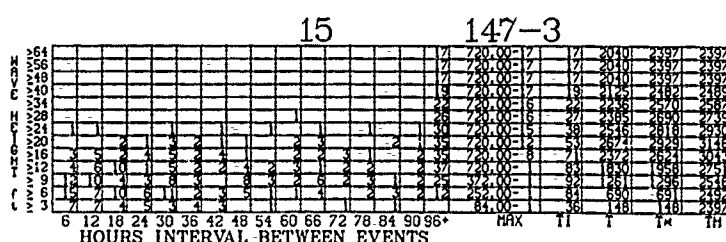
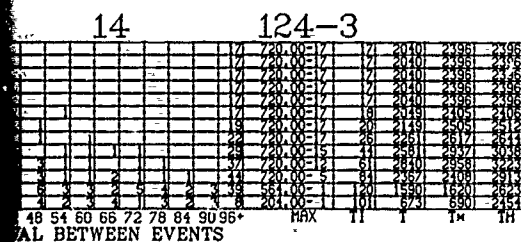
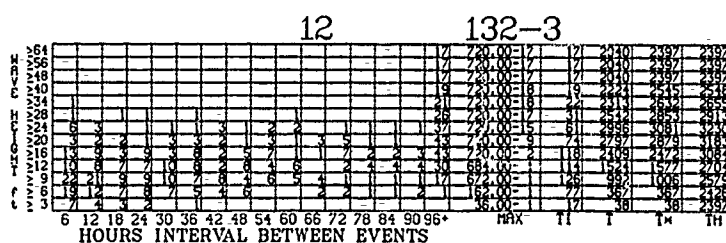
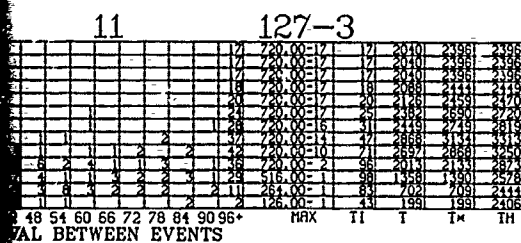
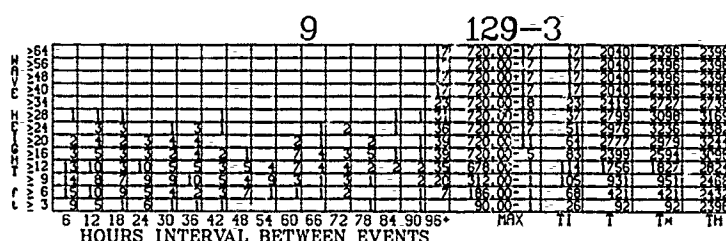
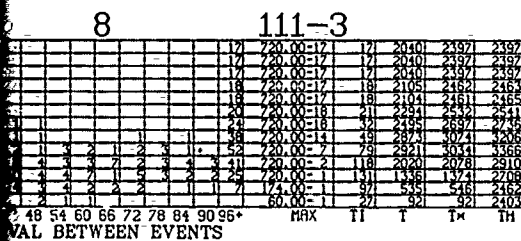
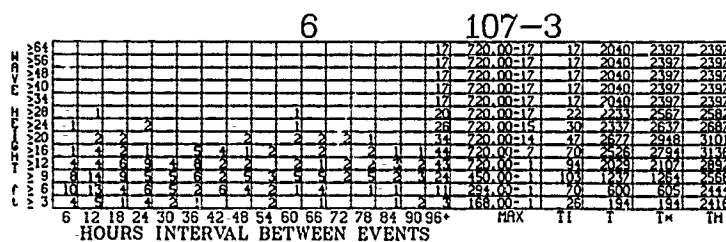
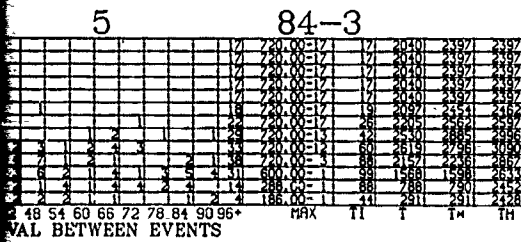
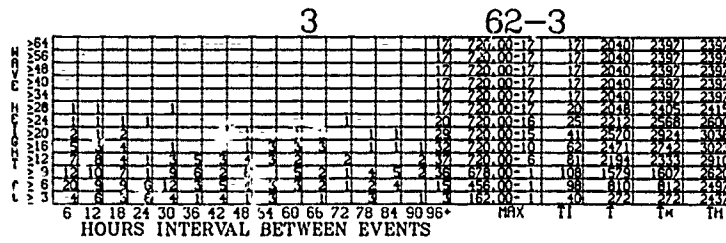
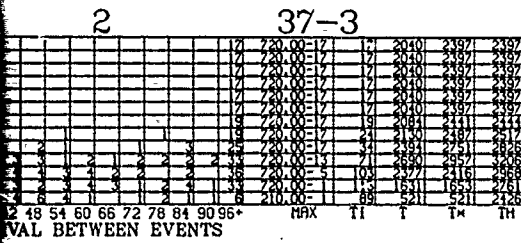
T2

# APRIL



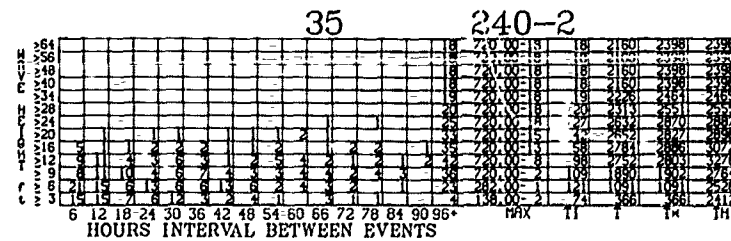
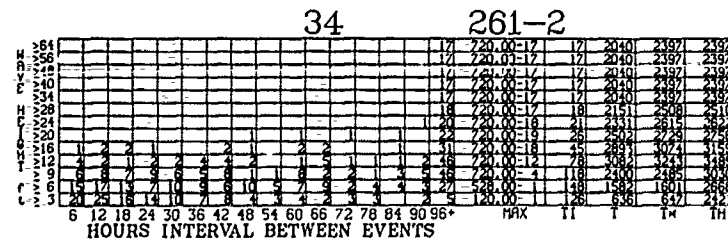
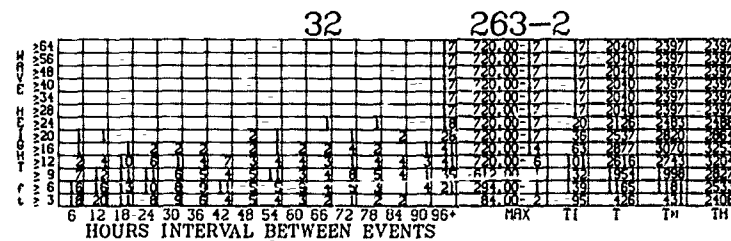
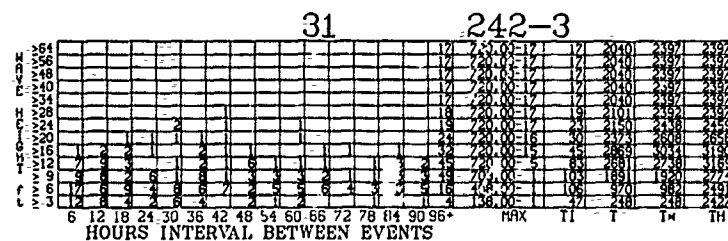
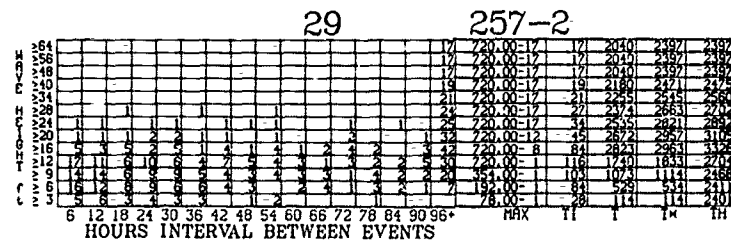
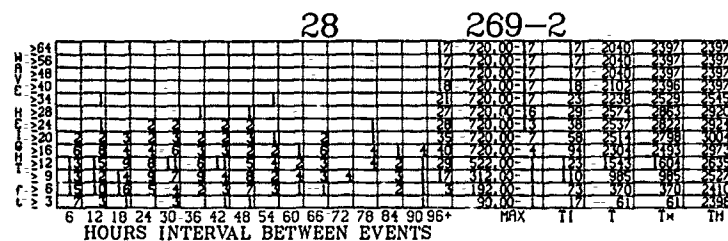
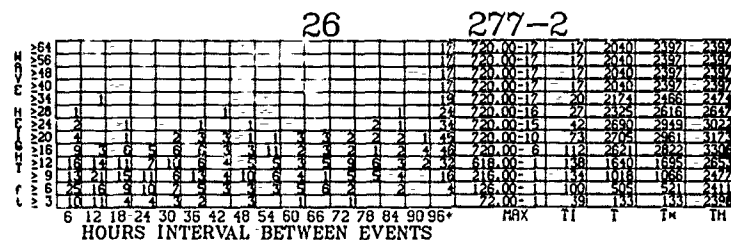
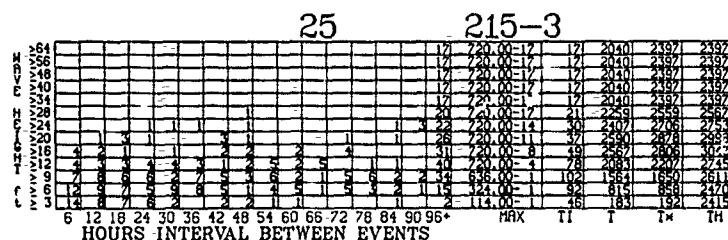
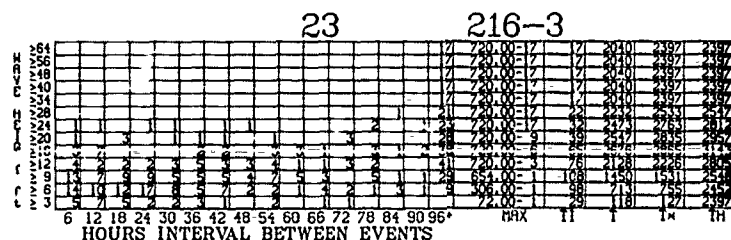
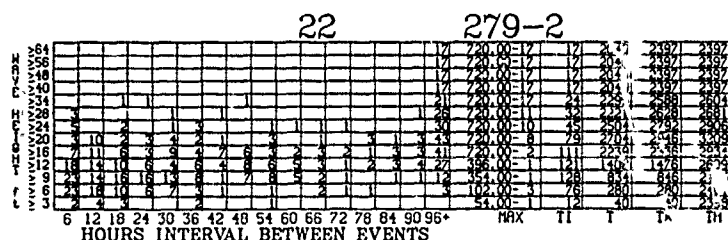
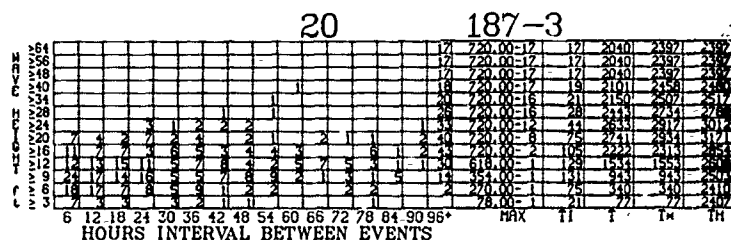
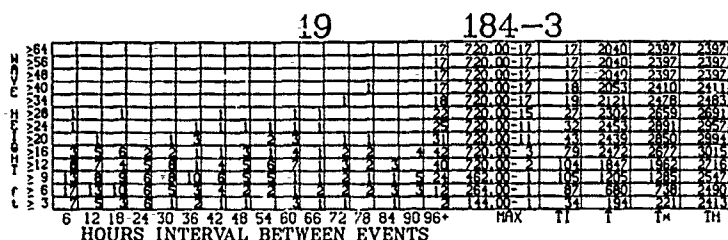


# WAVE HEIGHT INTERVALS





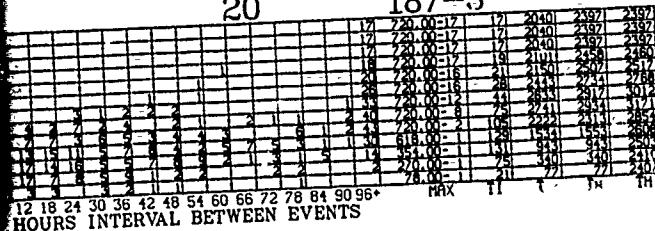
# WAVE HEIGHT INTERVALS (Cont'd)



# APRIL

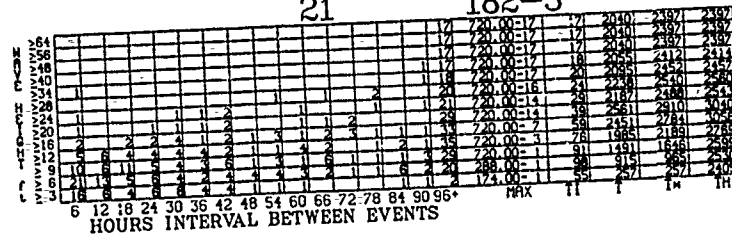
20

187-3



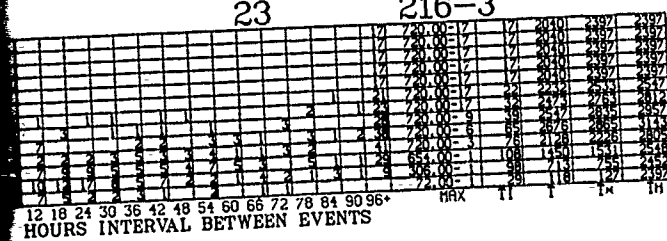
21

182-3



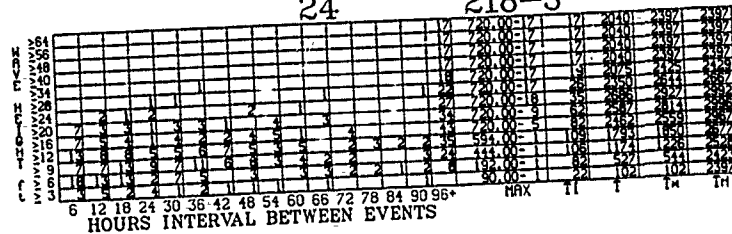
23

216-3



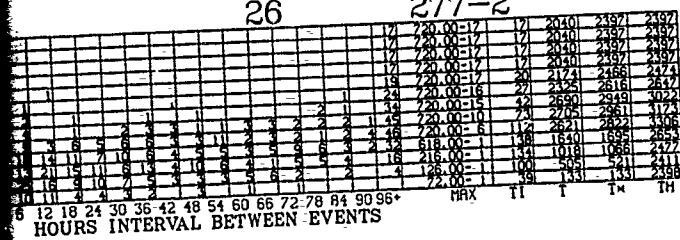
24

218-3



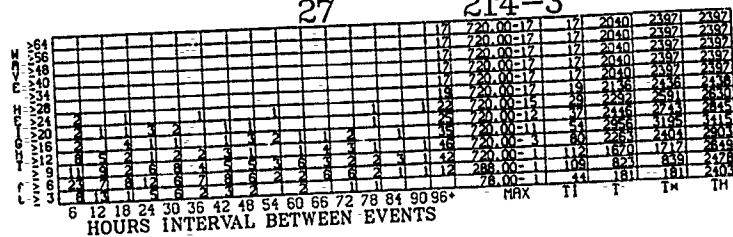
26

277-2



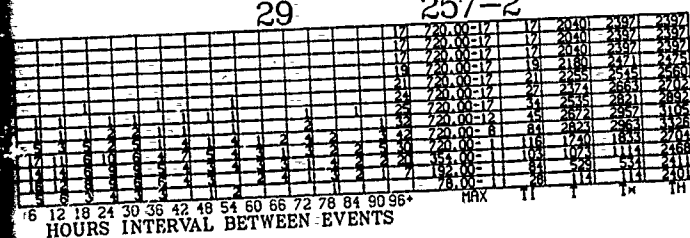
27

214-3



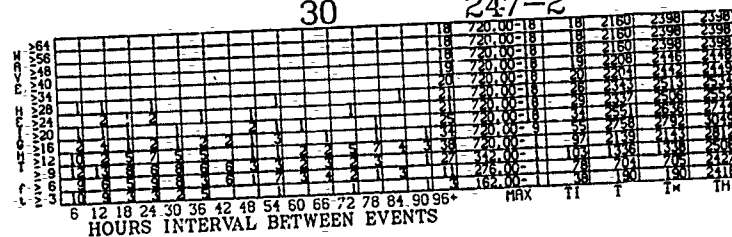
29

257-2



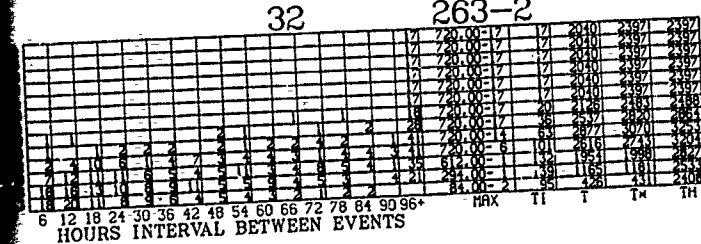
30

247-2



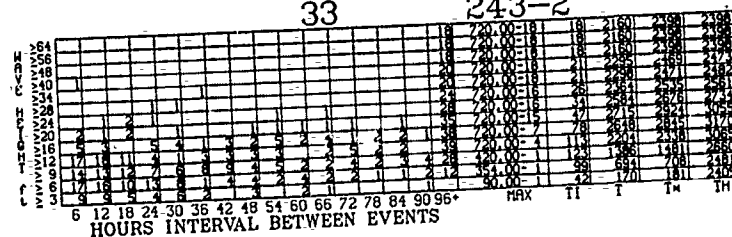
32

263-2



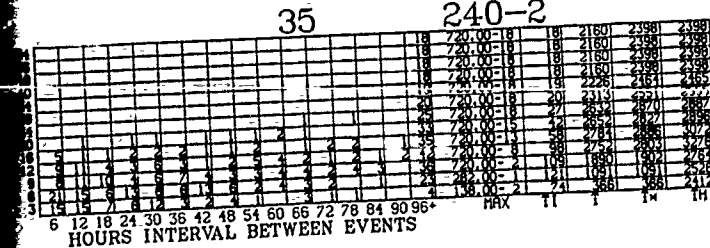
33

243-2



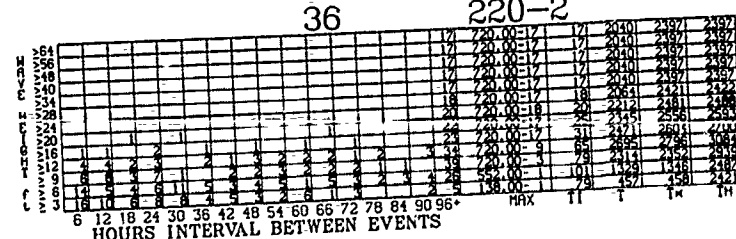
35

240-2



36

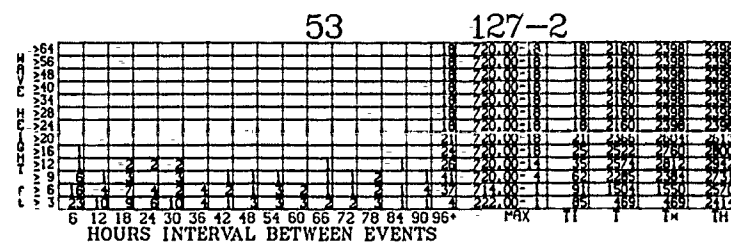
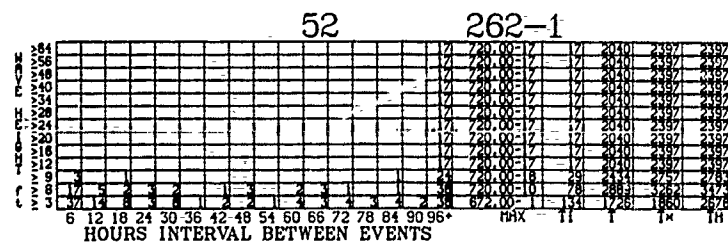
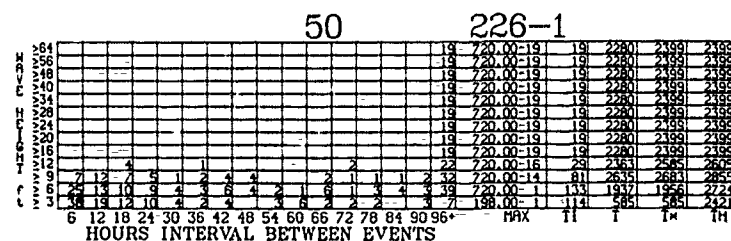
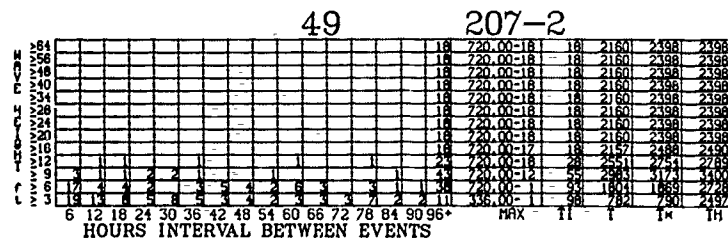
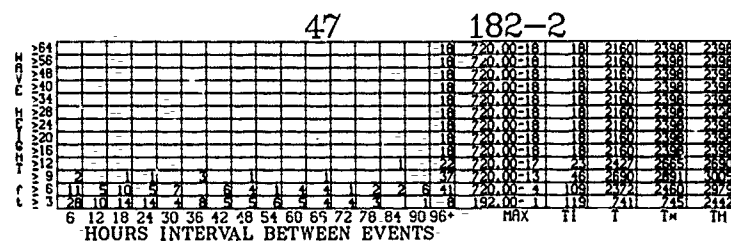
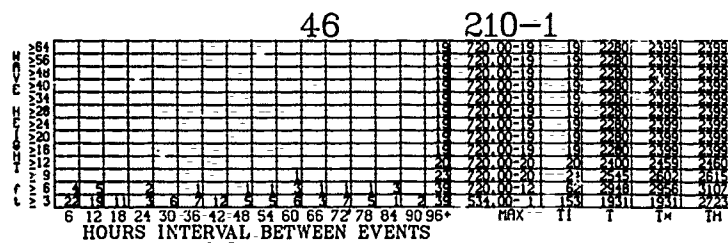
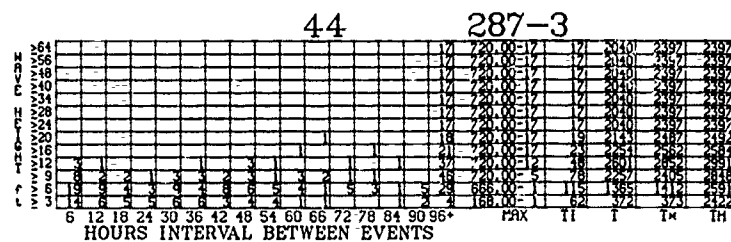
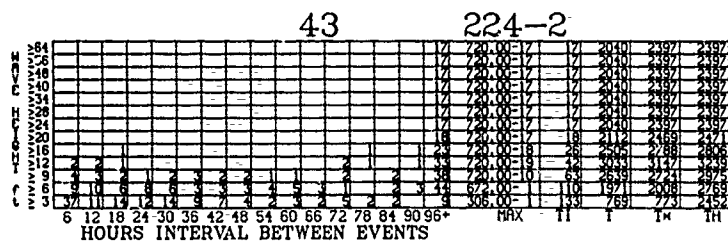
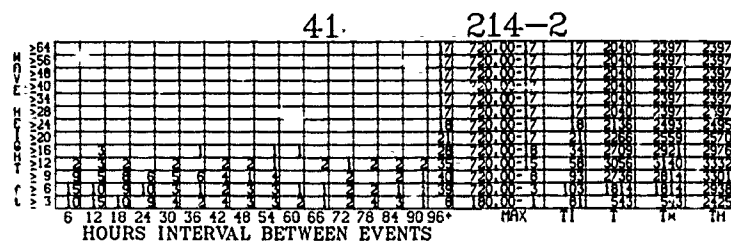
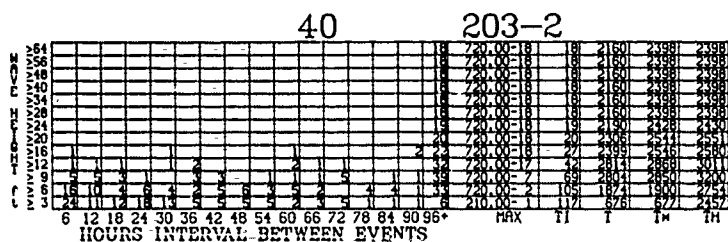
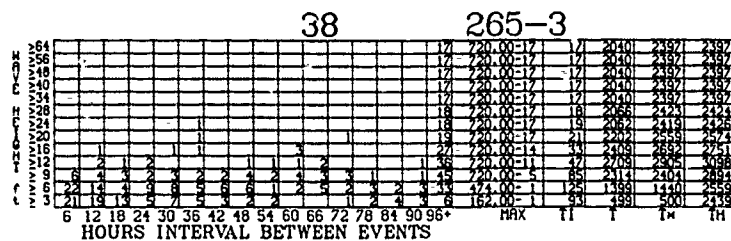
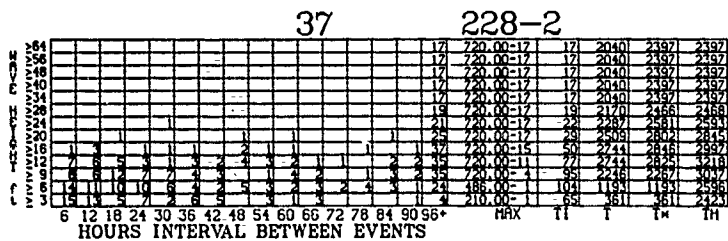
220-2



(2)

APRIL

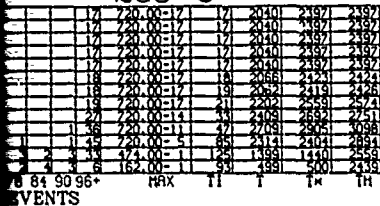
WAV



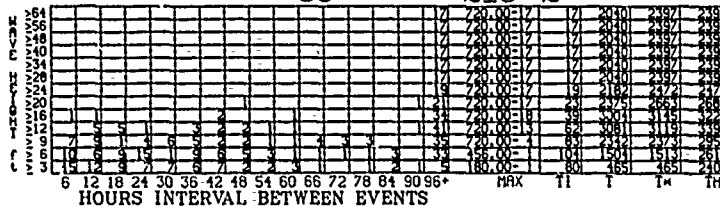
①

# WAVE HEIGHT INTERVALS (Cont'd)

265-3

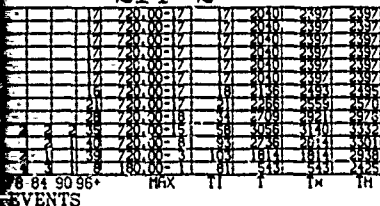


39

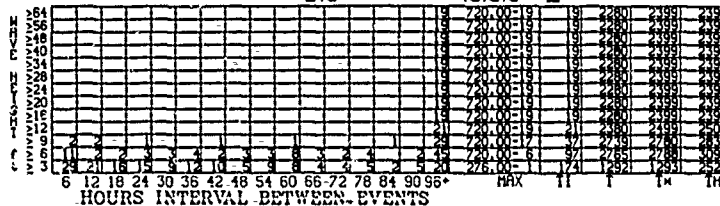


216-2

214-2

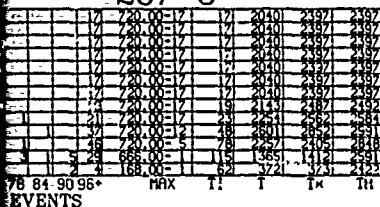


42

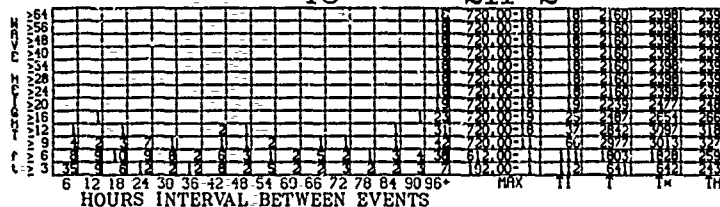


222-1

287-3

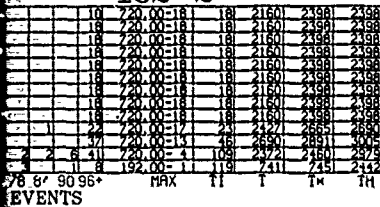


45

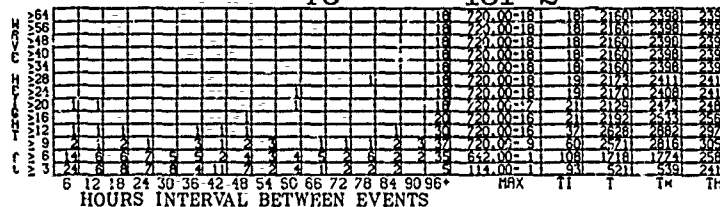


211-2

182-2

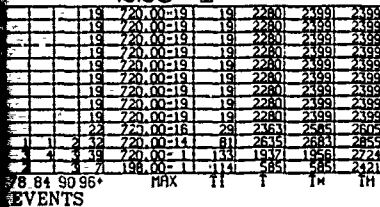


48

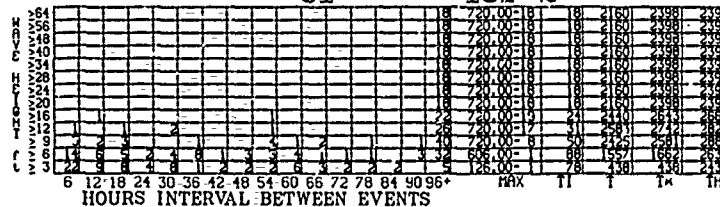


151-2

226-1

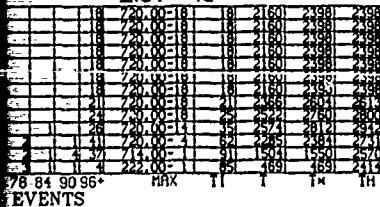


51

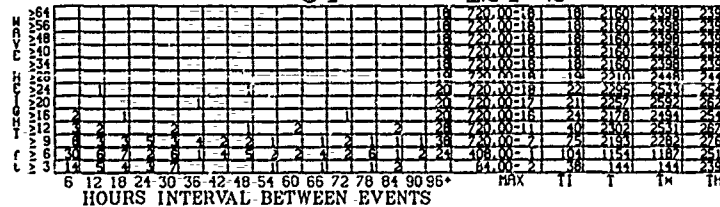


161-2

127-2

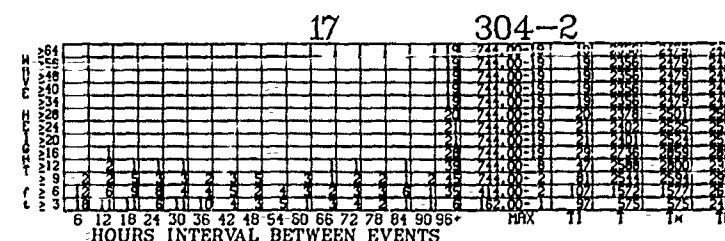
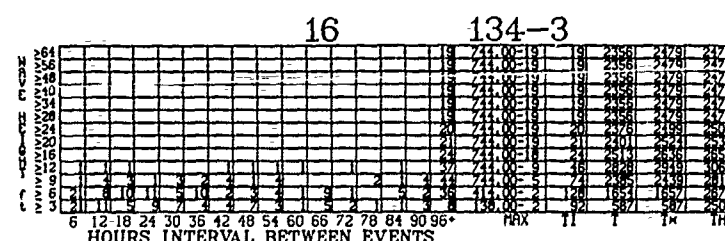
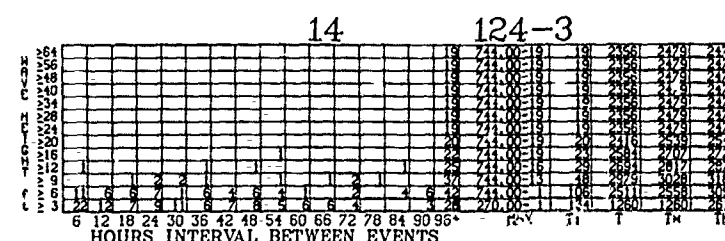
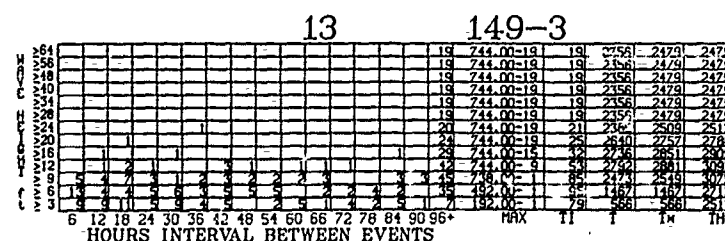
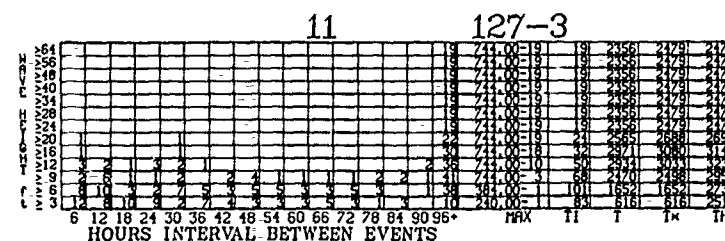
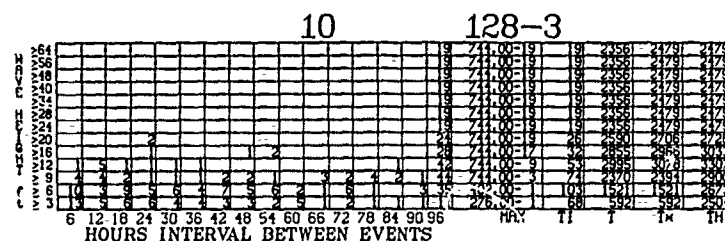
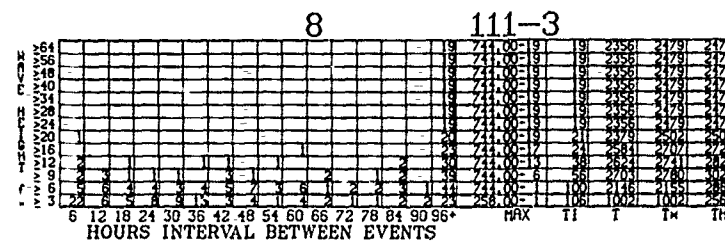
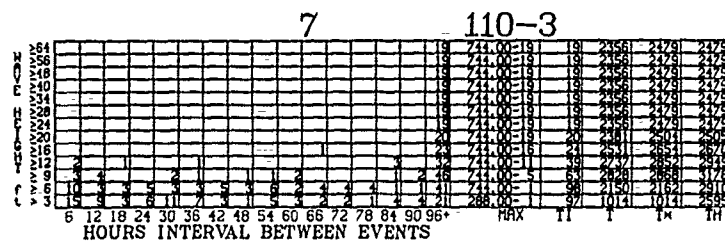
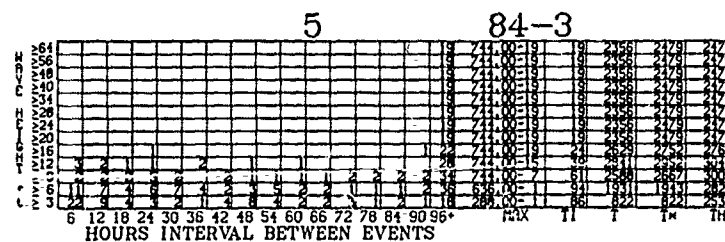
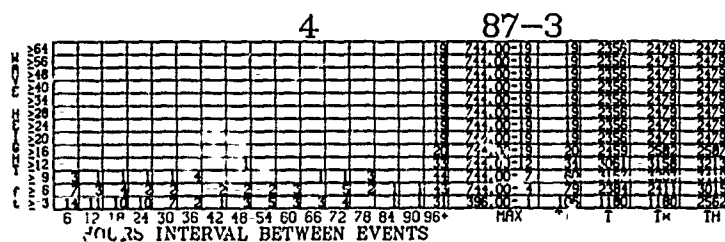
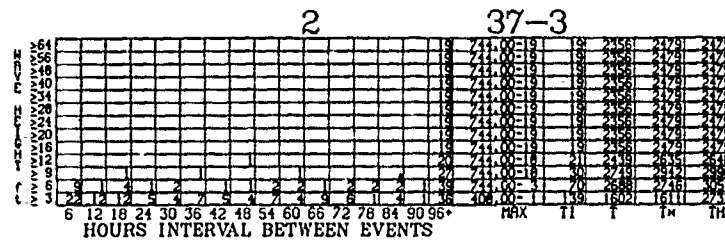
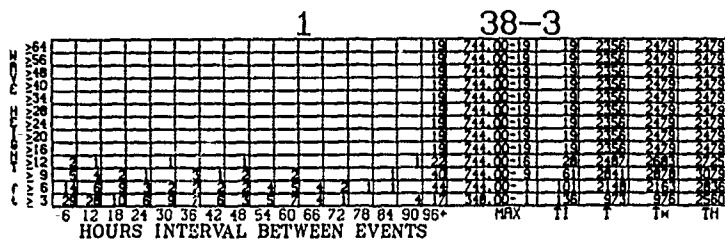


54



124-2

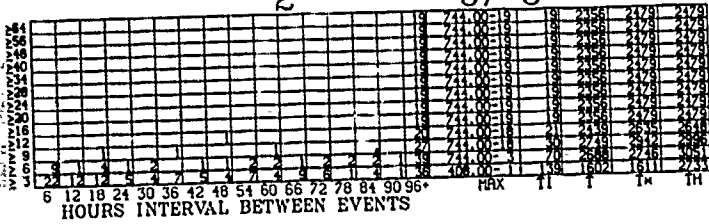
# WAVE HEIGHT INTERVALS



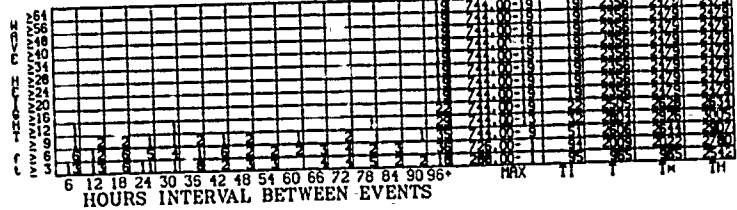


JULY

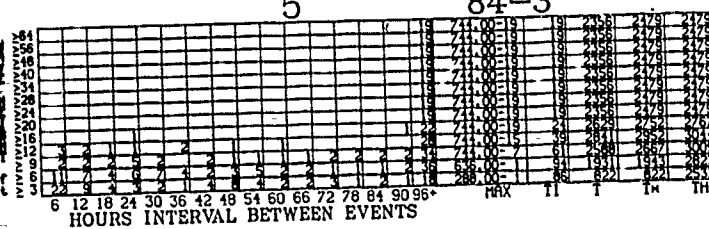
2 37-3



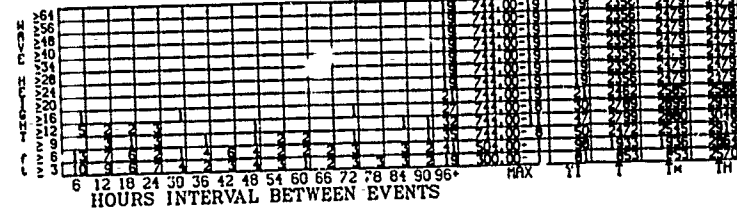
3 62-3



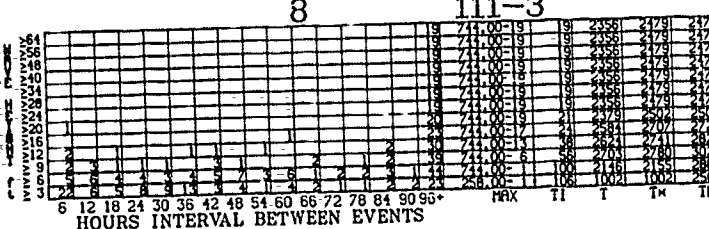
5 84-3



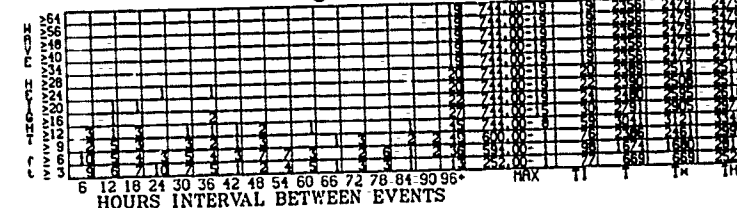
6 107-3



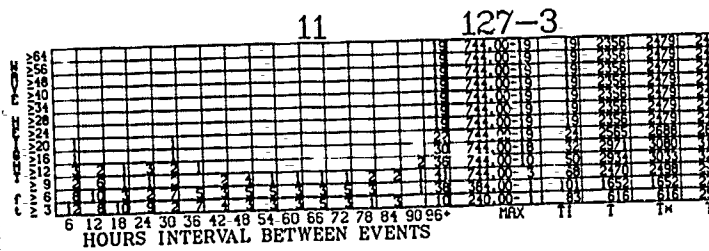
8 111-3



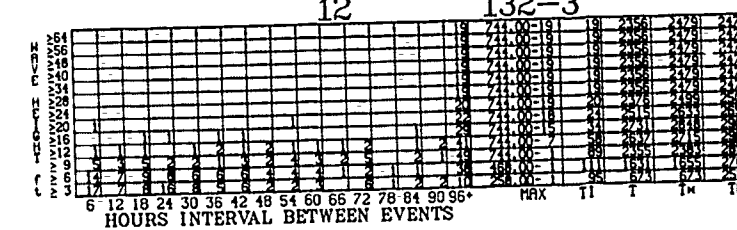
9 129-3



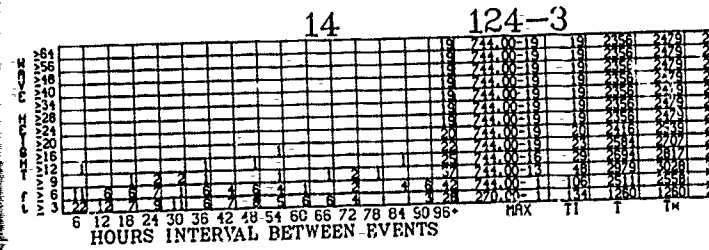
11 127-3



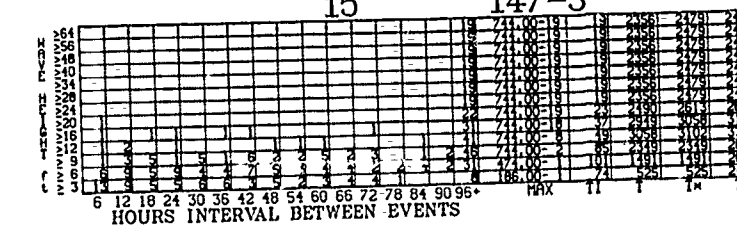
12 132-3



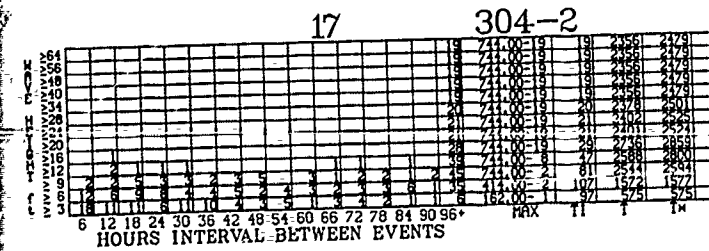
14 124-3



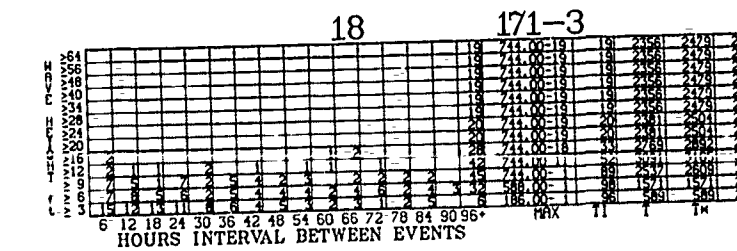
15 147-3



17 304-2



18 171-3

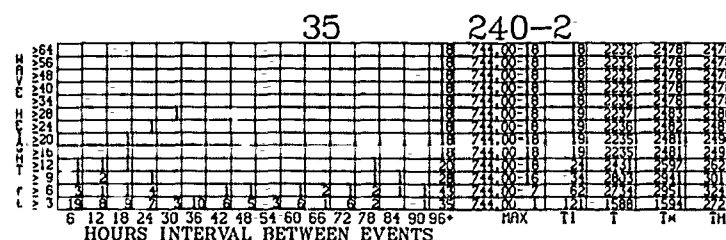
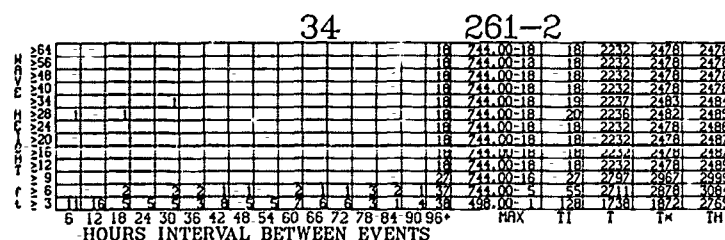
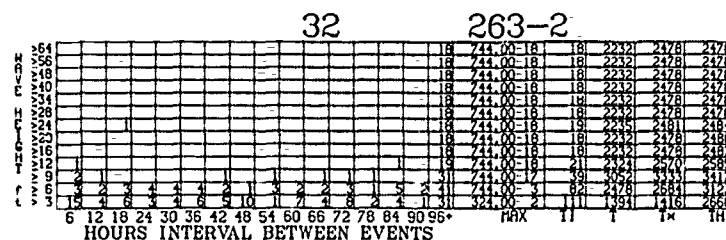
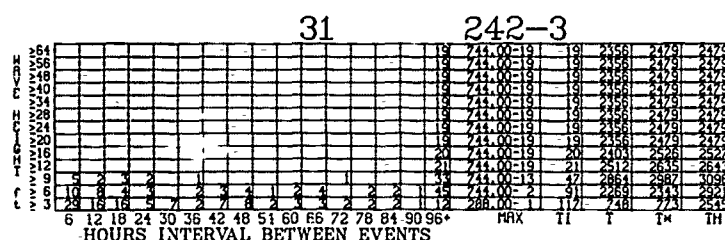
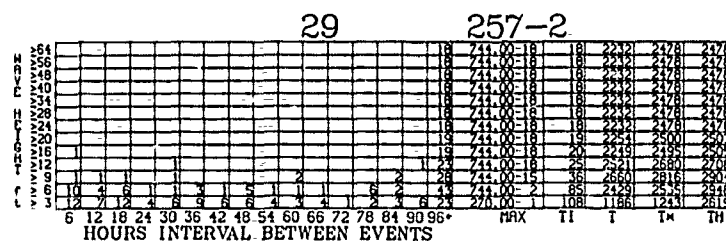
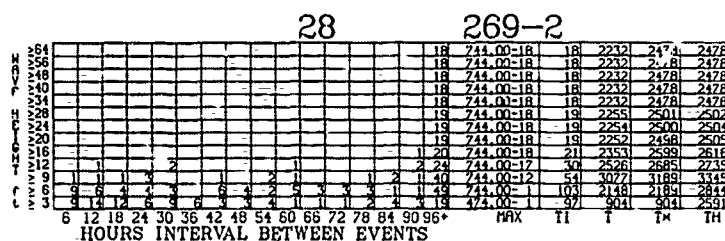
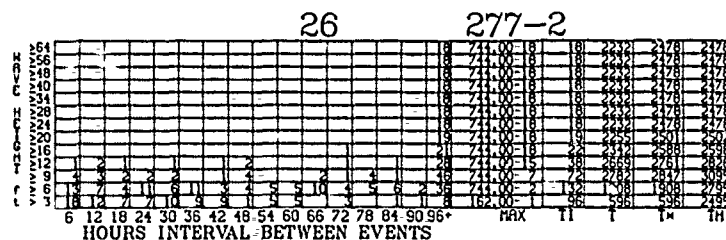
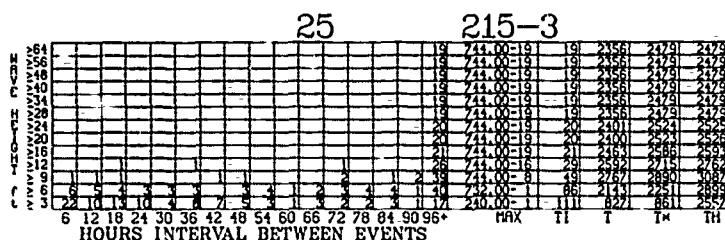
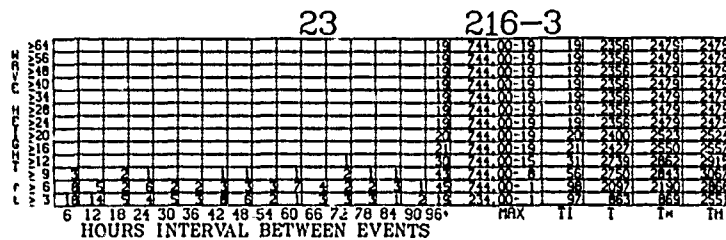
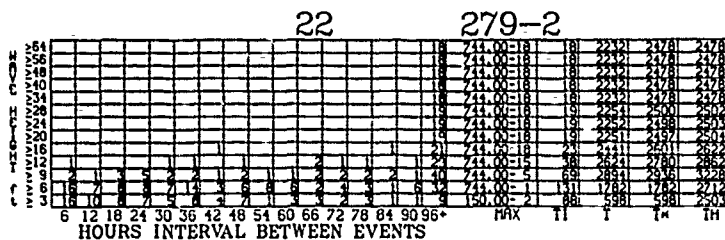
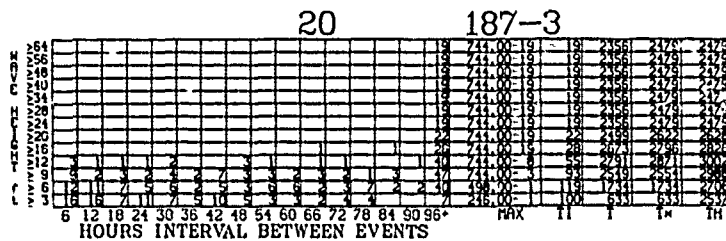
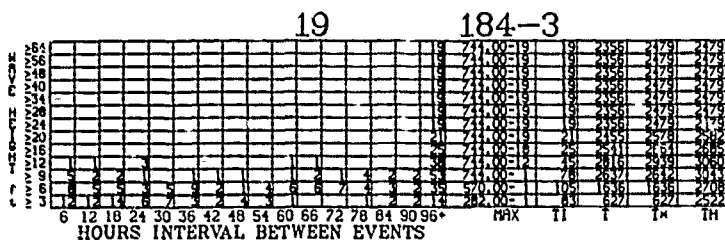


2



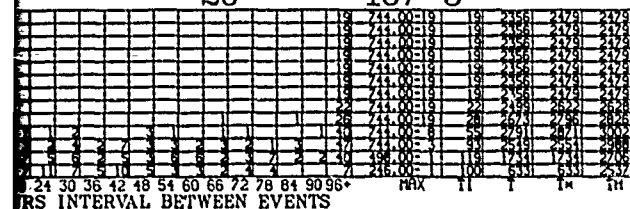
# JULY

# WAVE

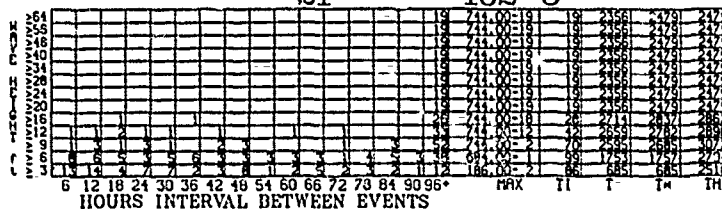


# WAVE HEIGHT INTERVALS (Cont'd)

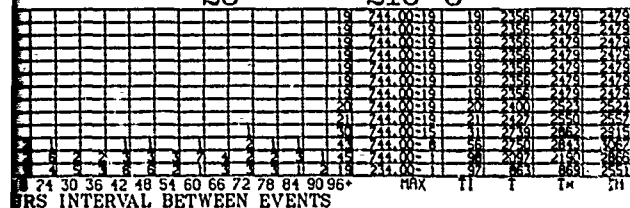
20 187-3



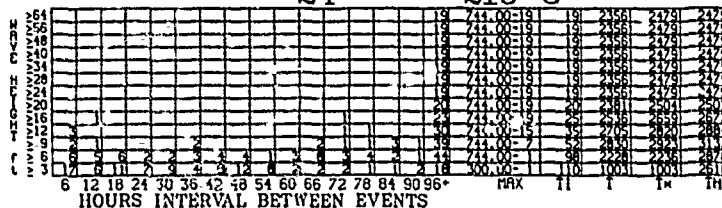
21 182-3



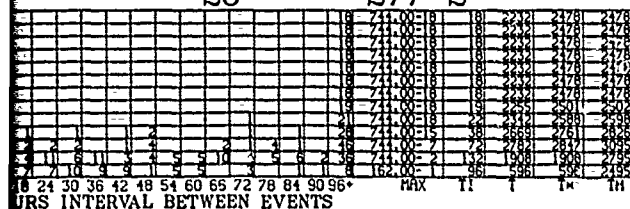
23 216-3



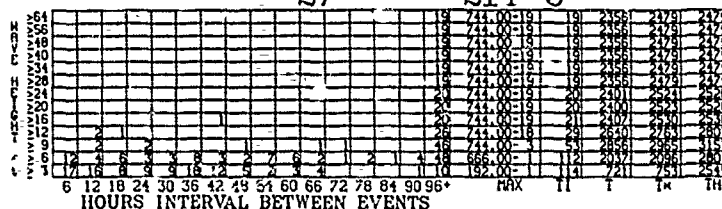
24 218-3



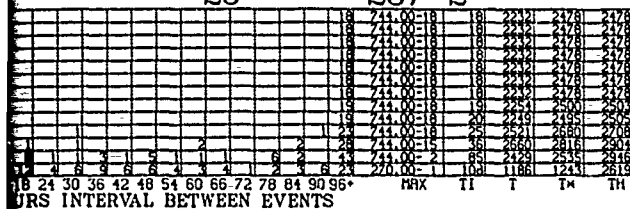
26 277-2



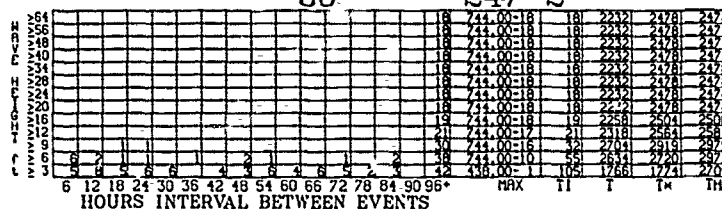
27 214-3



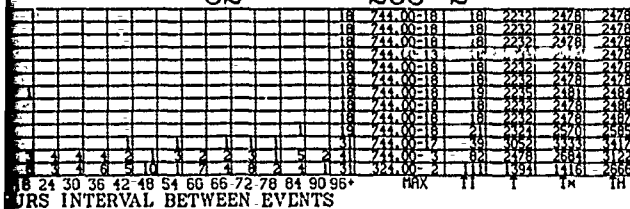
29 257-2



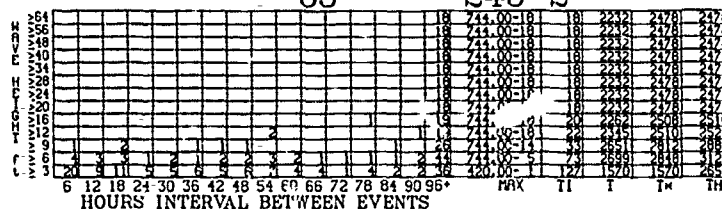
30 247-2



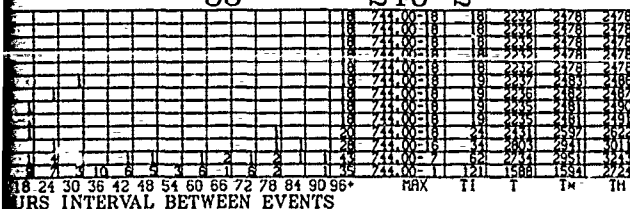
32 263-2



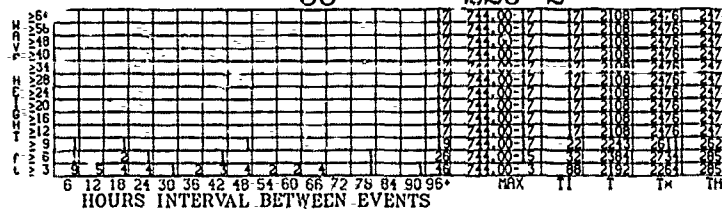
33 243-2



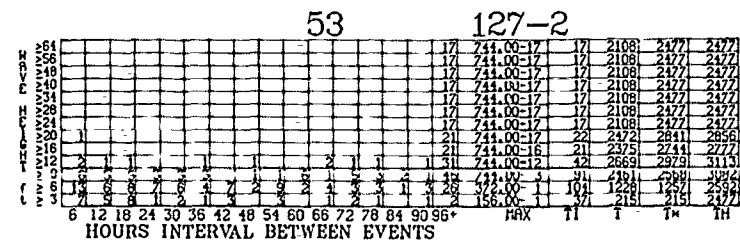
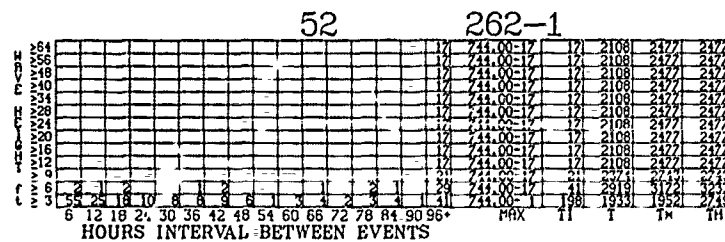
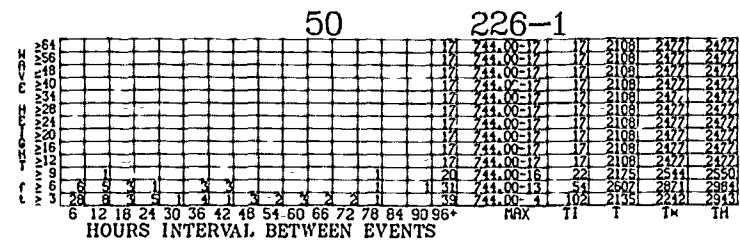
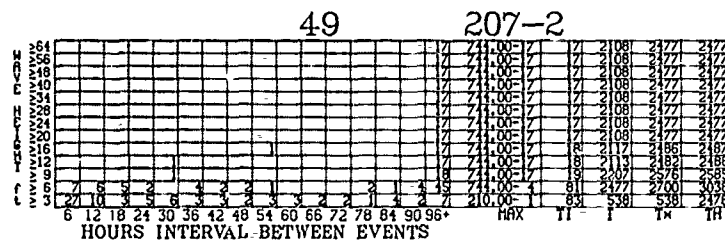
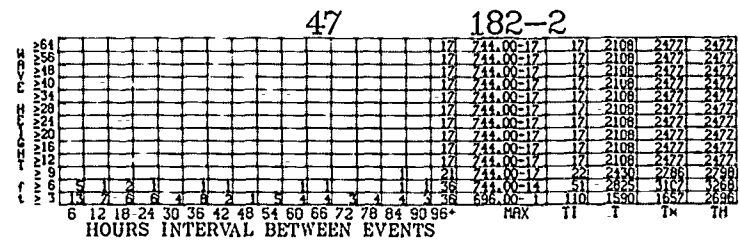
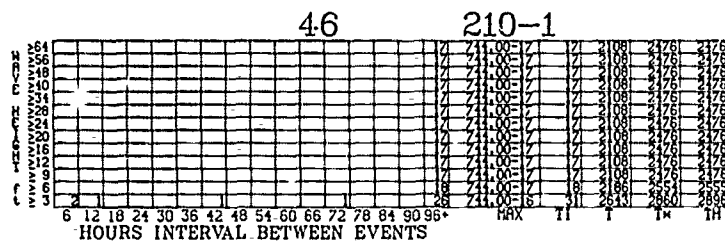
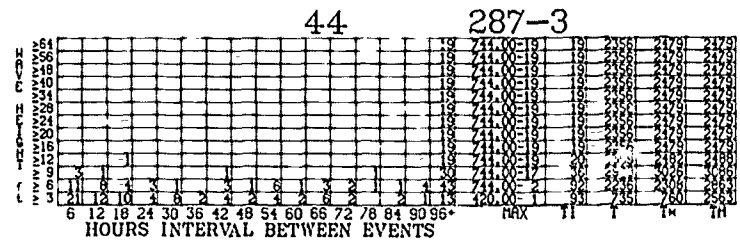
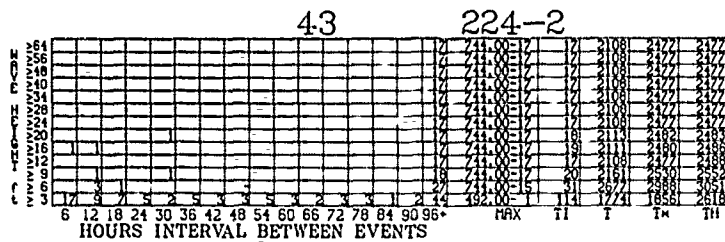
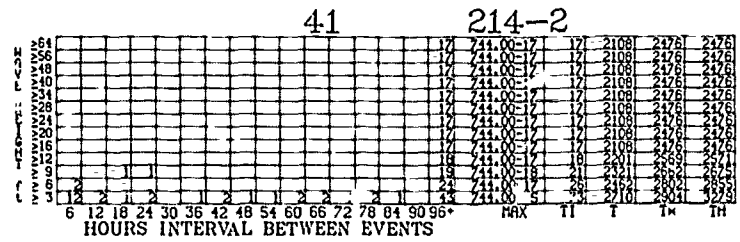
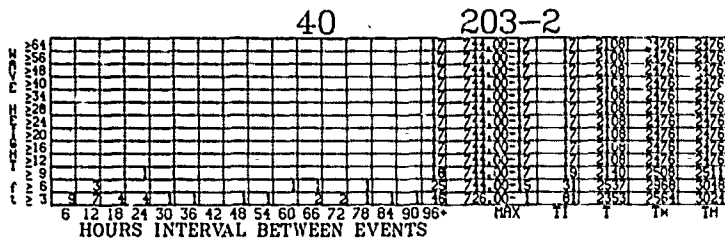
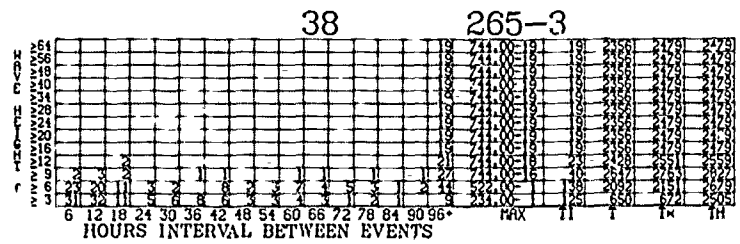
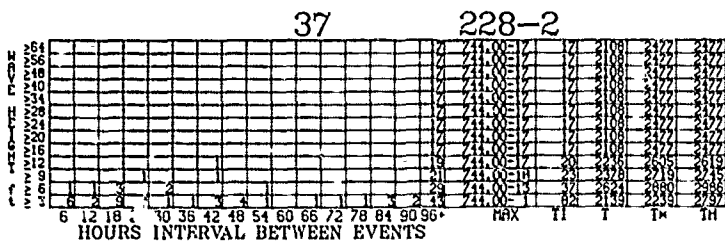
35 240-2



36 220-2

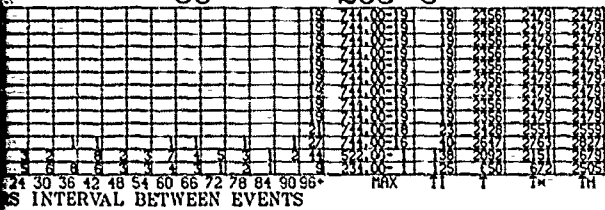


# WAVE HEIGHT INTERVALS (Cont'd)

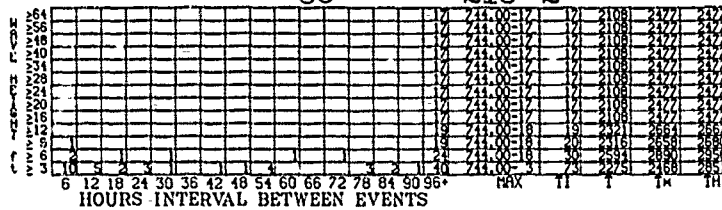


JULY

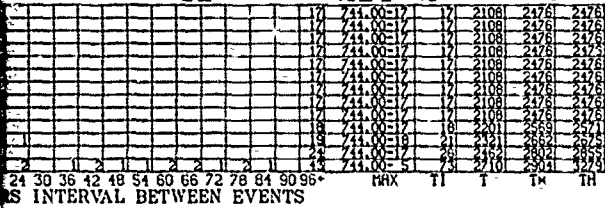
38 265-3



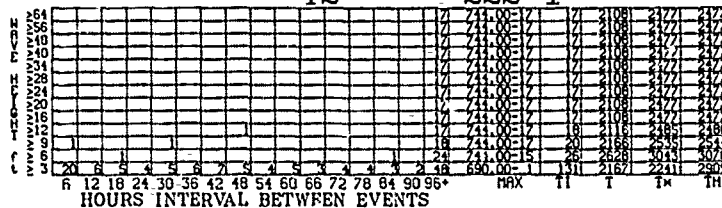
39 216-2



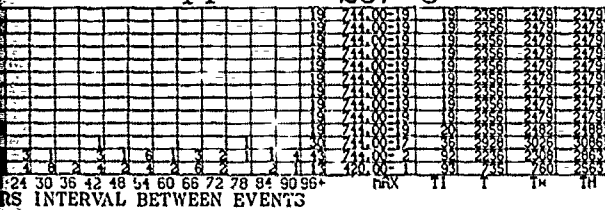
41 214-2



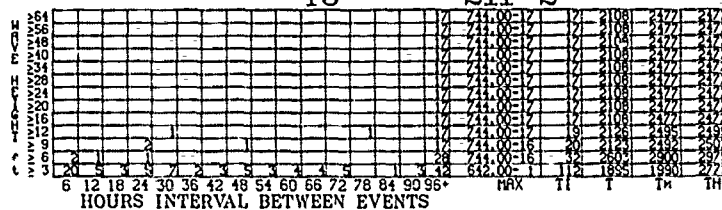
42 222-1



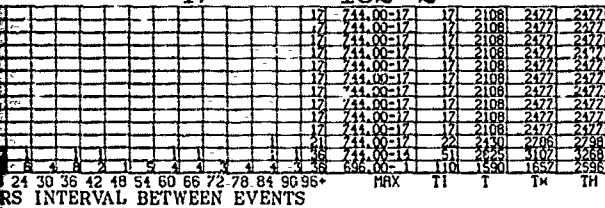
44 287-3



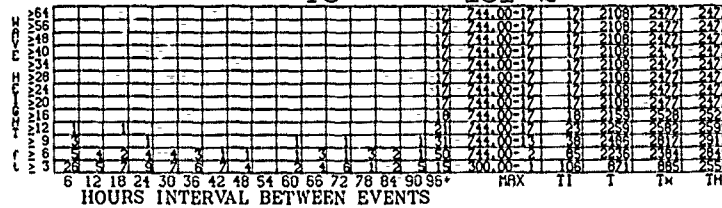
45 211-2



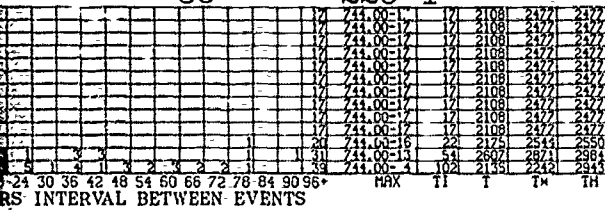
47 182-2



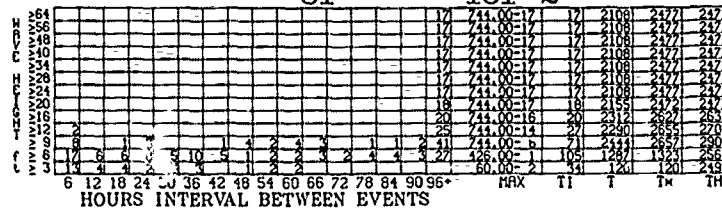
48 151-2



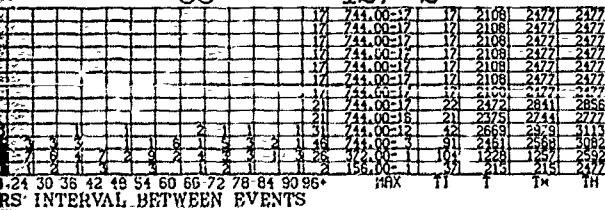
50 226-1



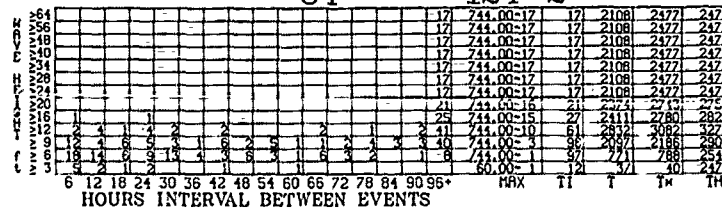
51 161-2



53 127-2



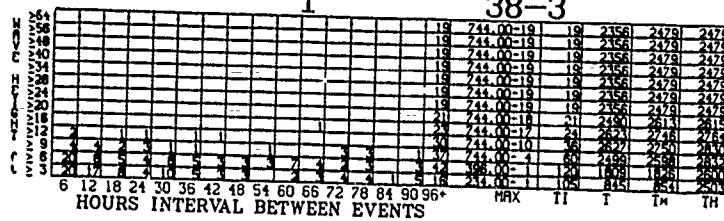
54 124-2



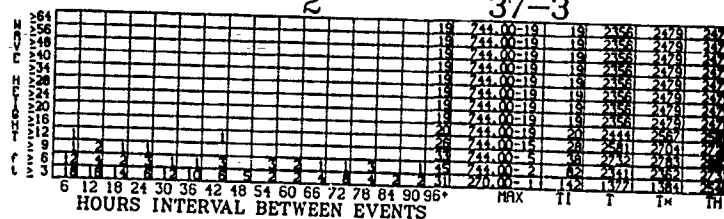
(2)

# AUGUST

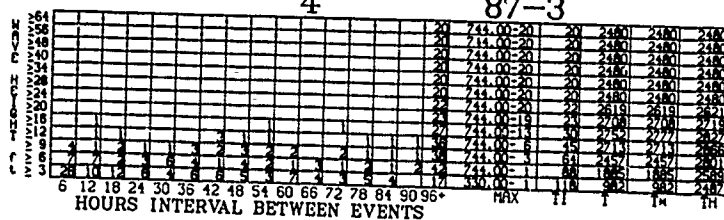
1 38-3



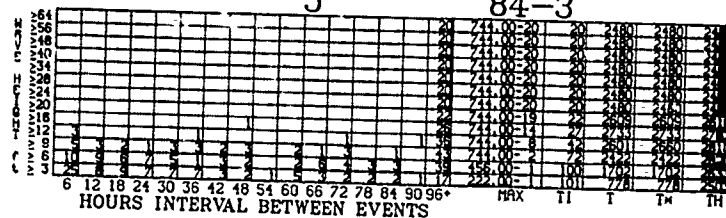
2 37-3



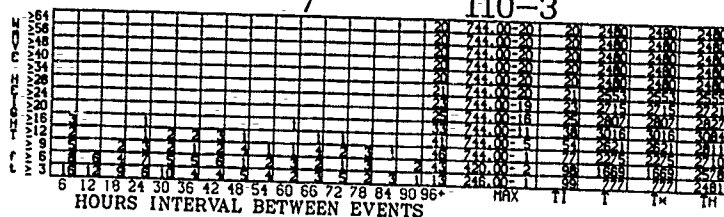
4 87-3



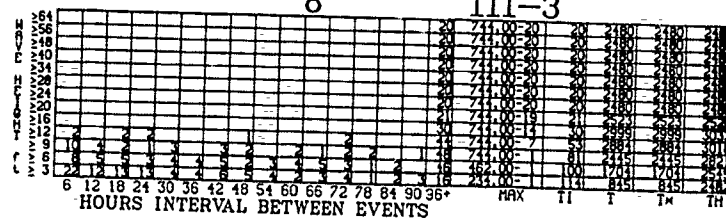
5 84-3



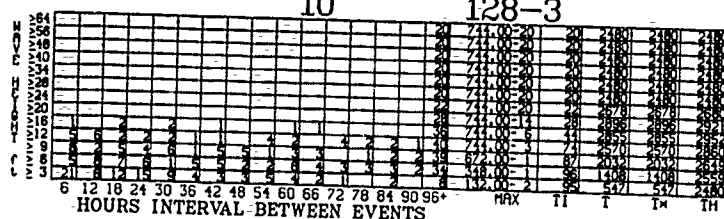
7 110-3



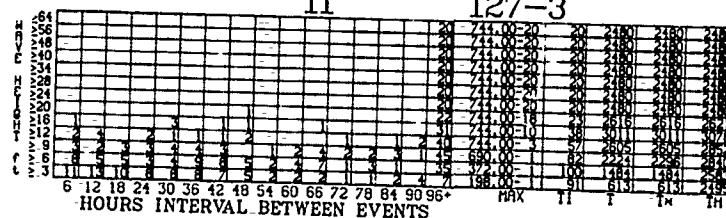
8 111-3



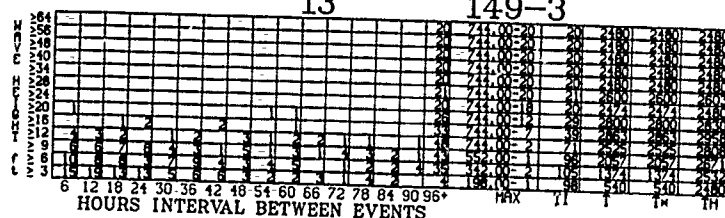
10 128-3



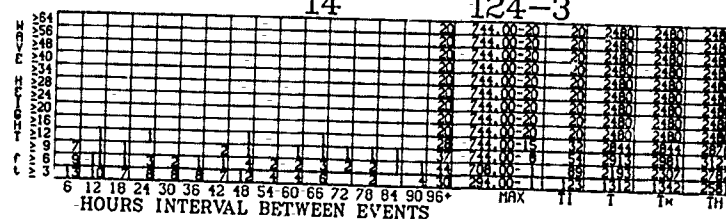
11 127-3



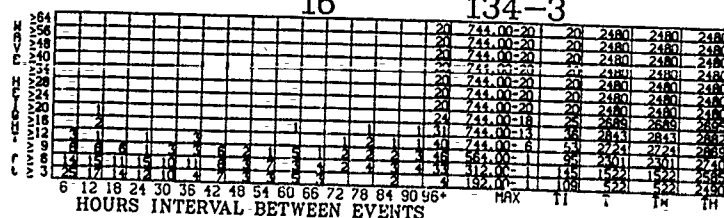
13 149-3



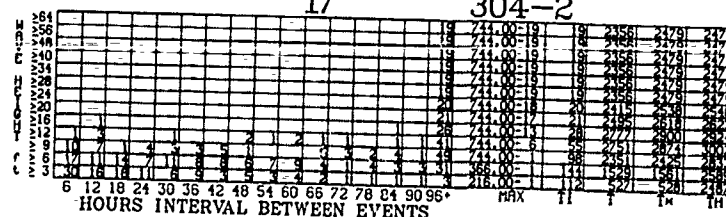
14 124-3



16 134-3



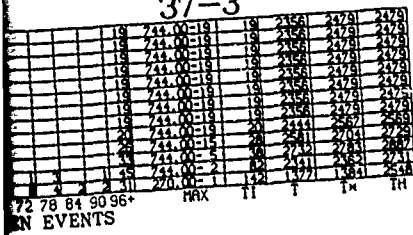
17 304-2





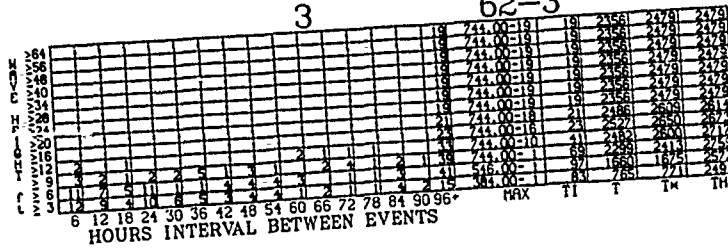
# WAVE HEIGHT INTERVALS

37-3

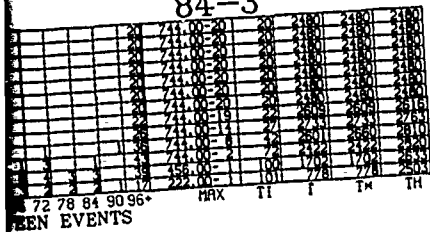


3

62-3

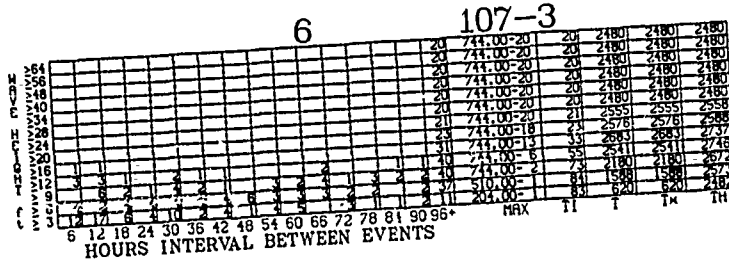


84-3

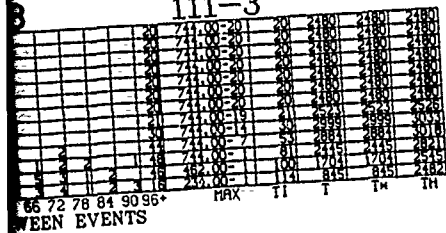


6

107-3

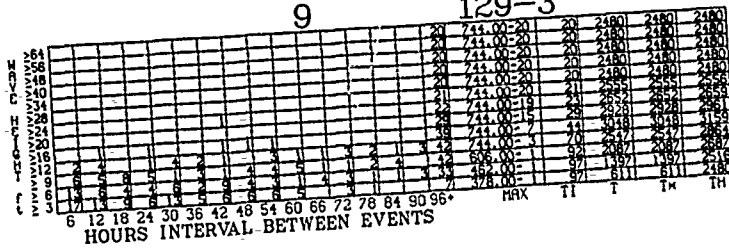


111-3

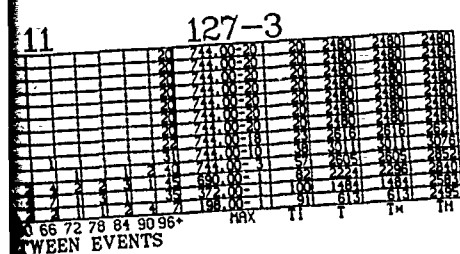


9

129-3

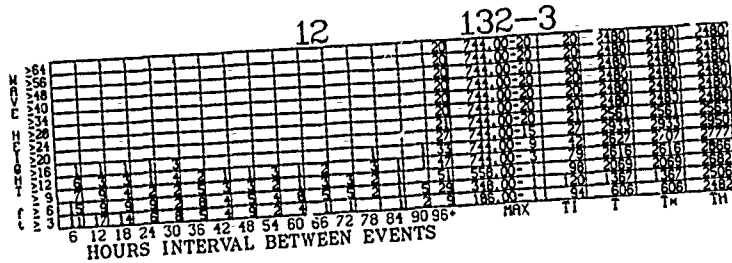


127-3



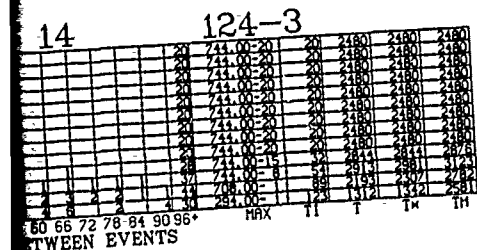
12

132-3



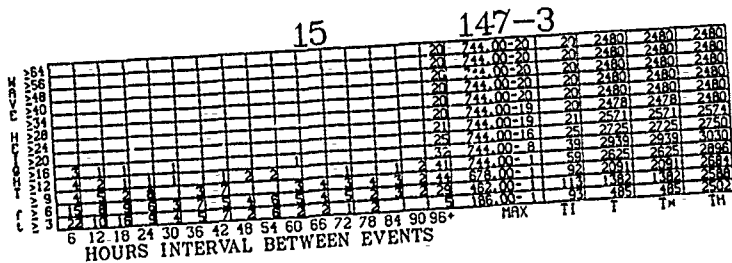
14

124-3



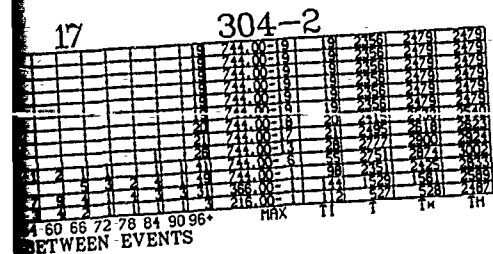
15

147-3



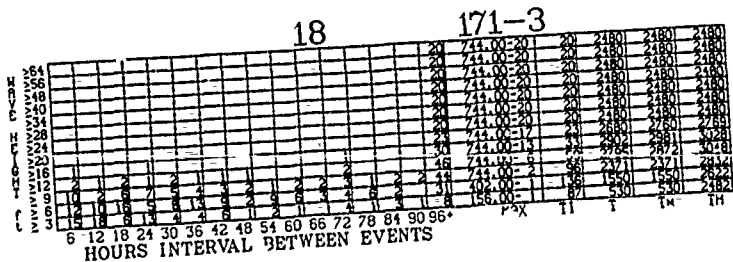
17

304-2



18

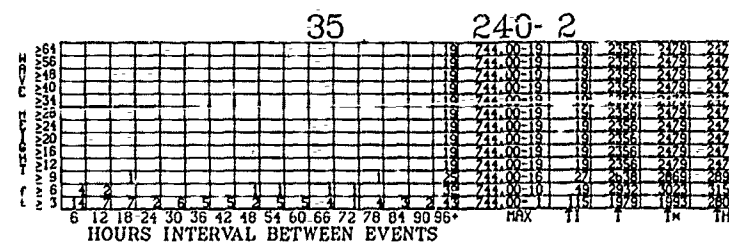
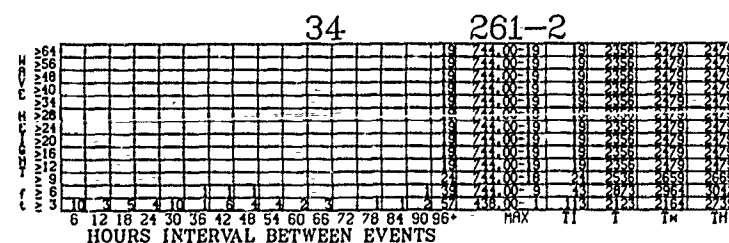
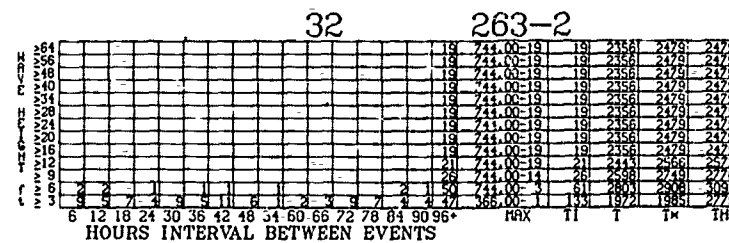
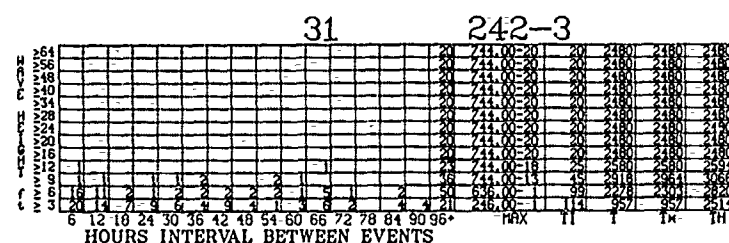
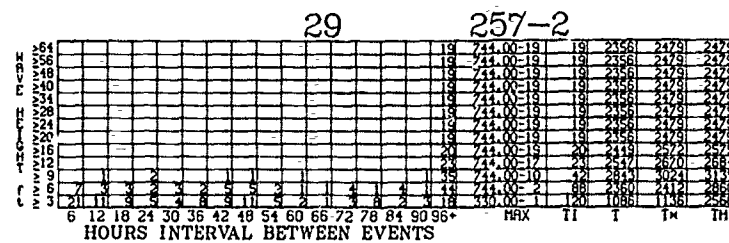
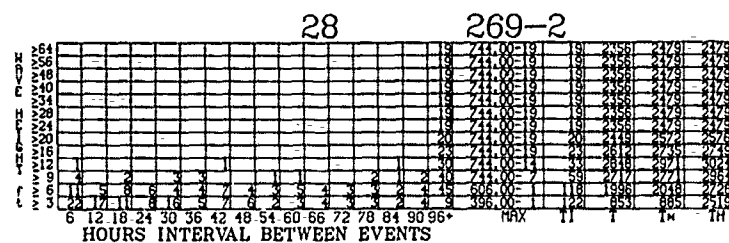
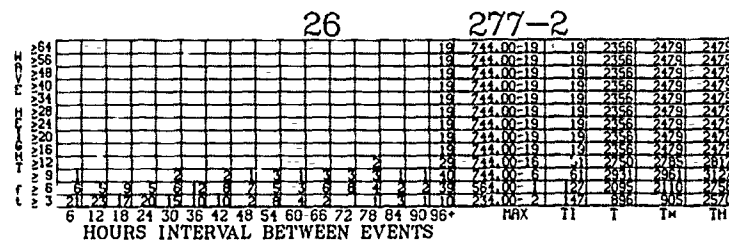
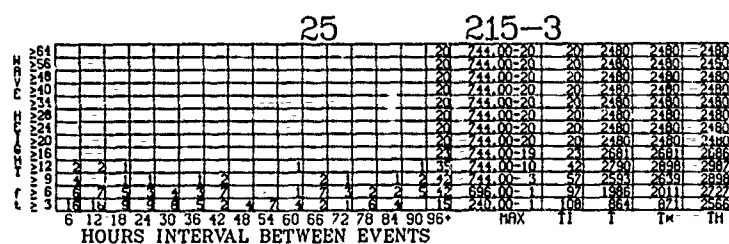
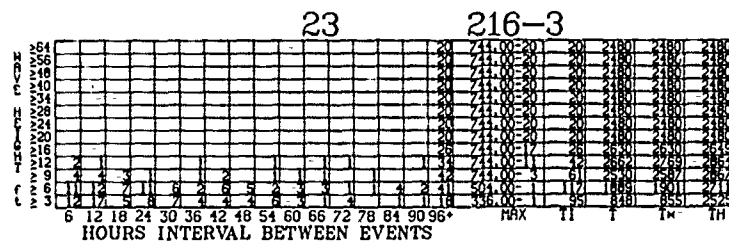
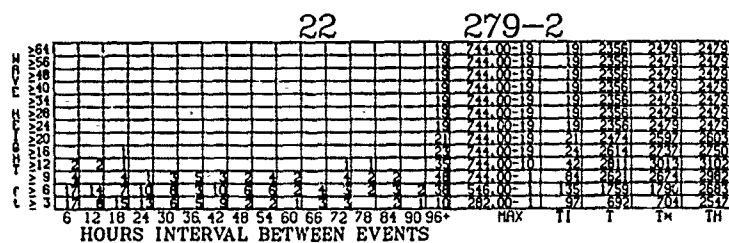
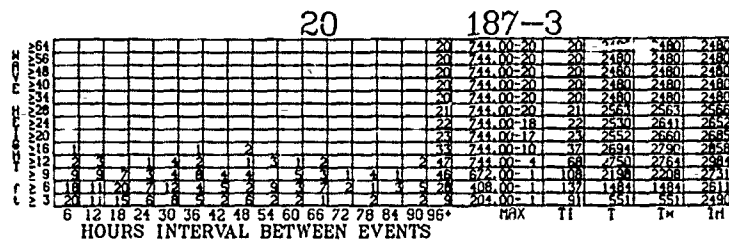
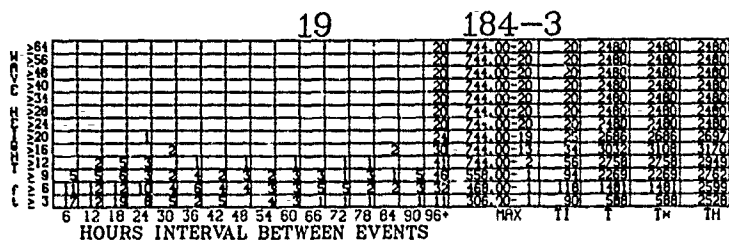
171-3



(2)

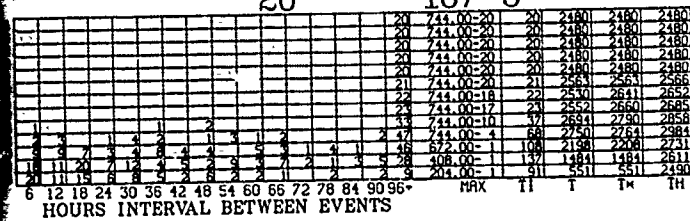


# WAVE HEIGHT INTERVALS (Cont'd)

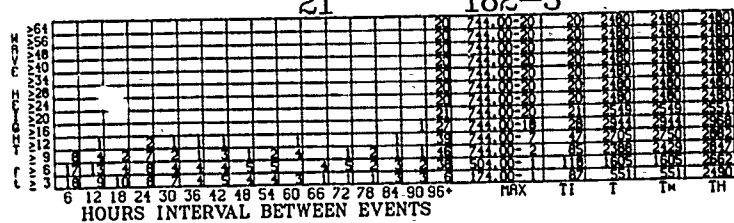


# AUGUST

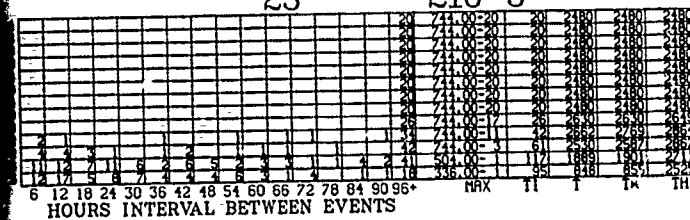
20 187-3



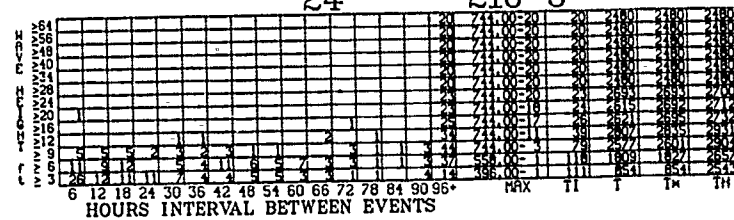
21 182-3



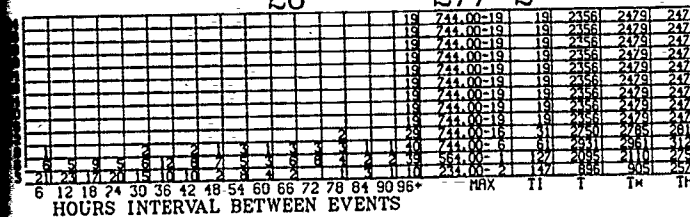
23 216-3



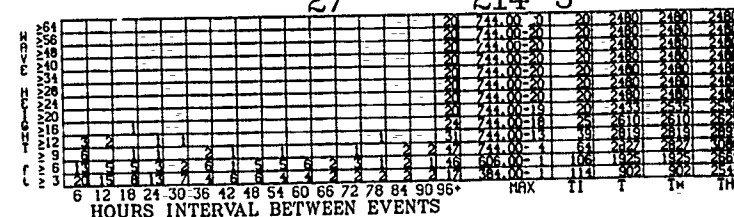
24 218-3



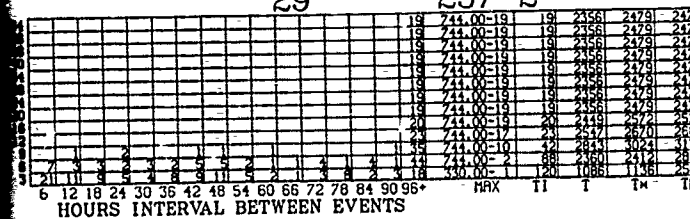
26 277-2



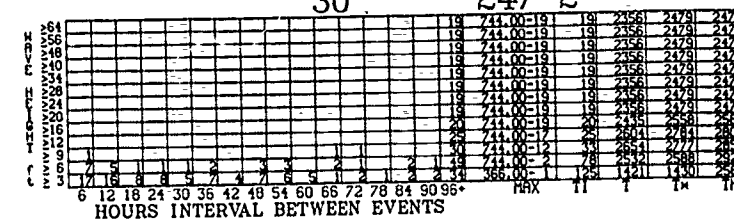
27 214-3



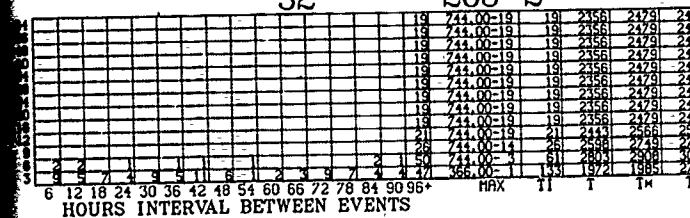
29 257-2



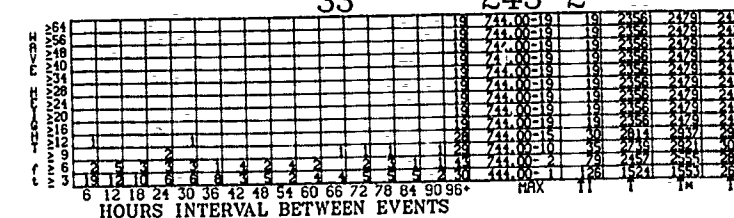
30 247-2



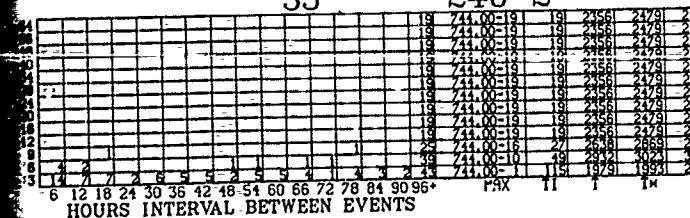
32 263-2



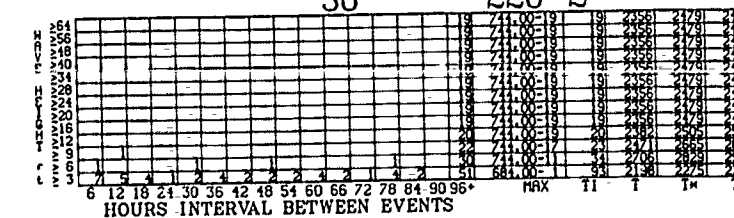
33 243-2



35 240-2

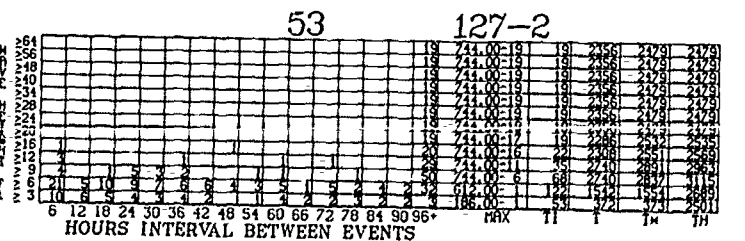
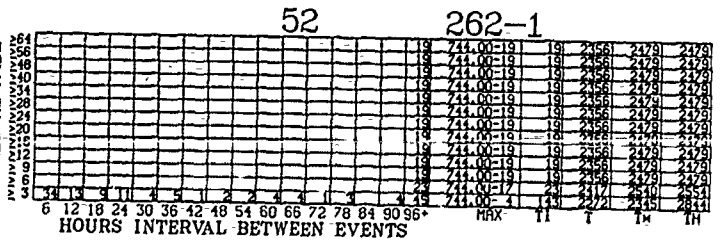
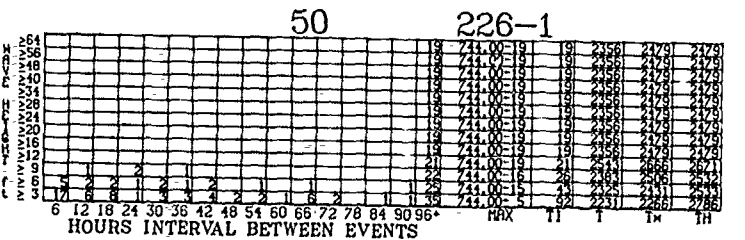
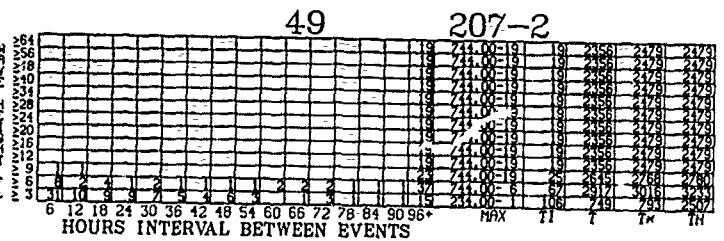
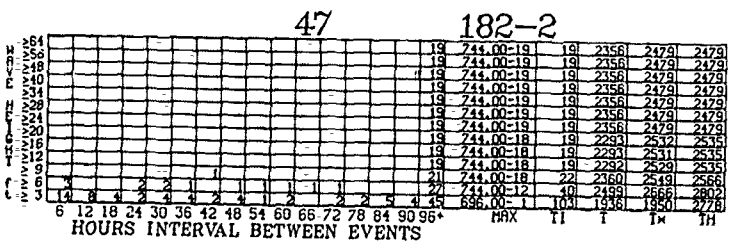
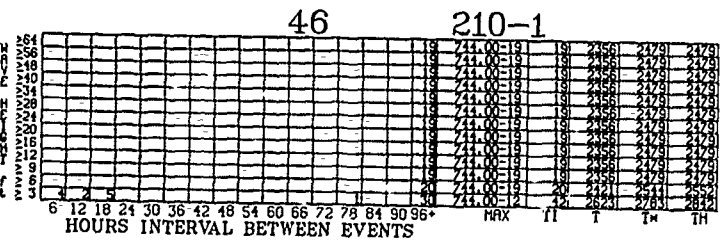
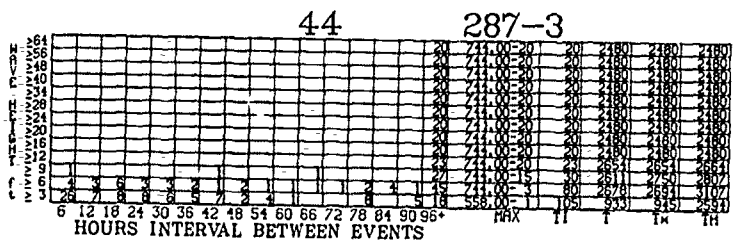
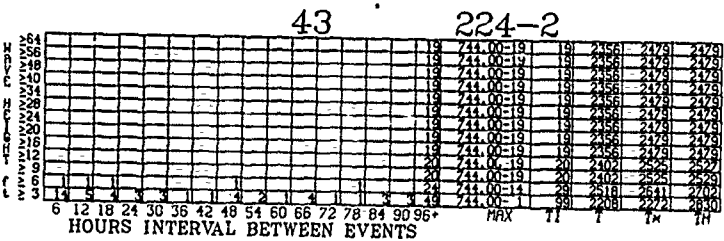
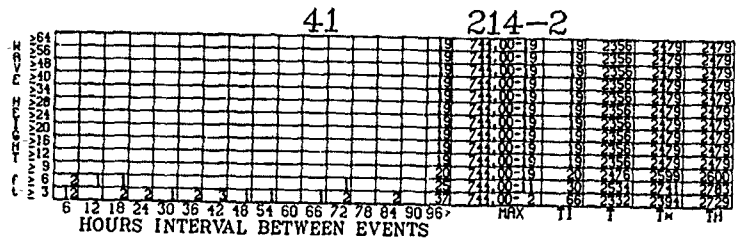
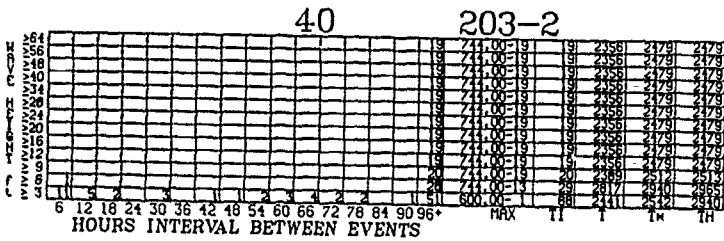
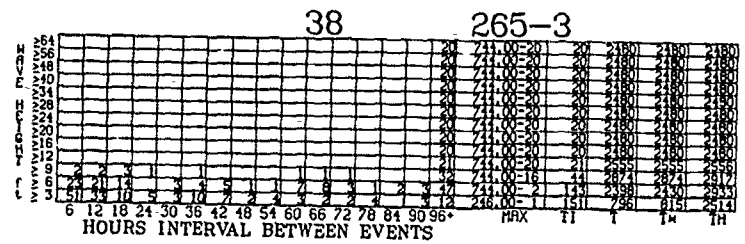
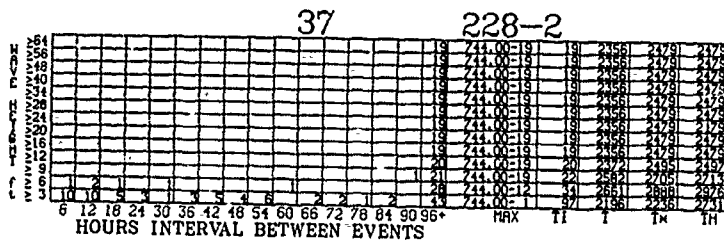


36 220-2

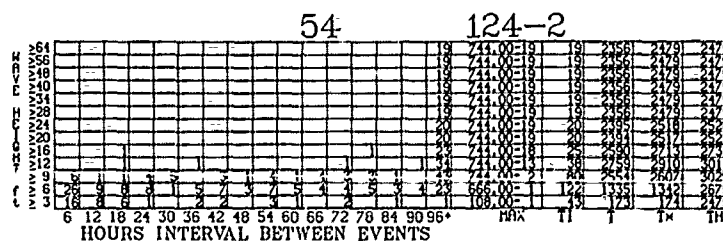
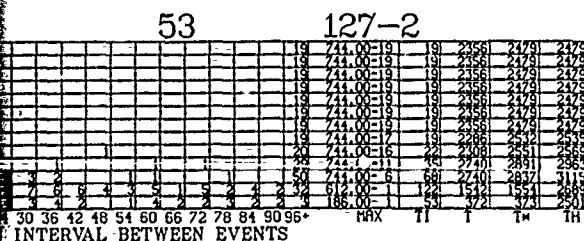
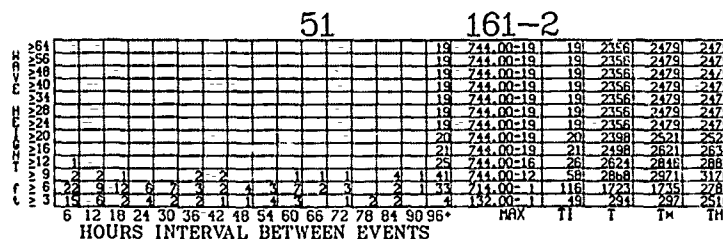
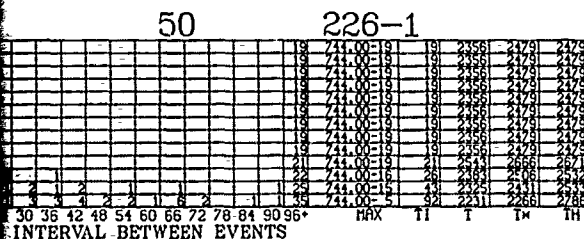
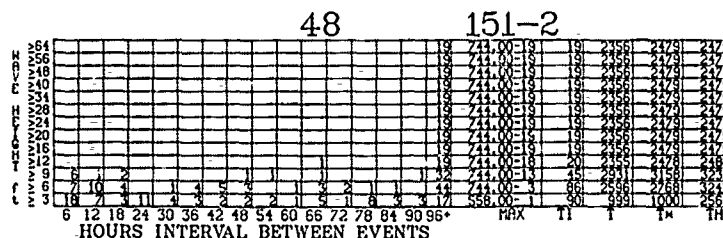
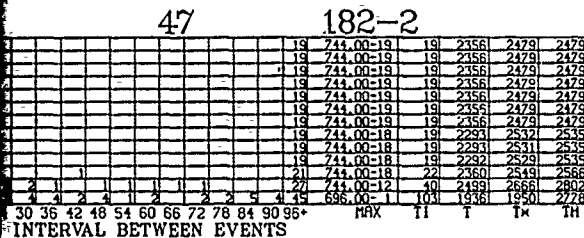
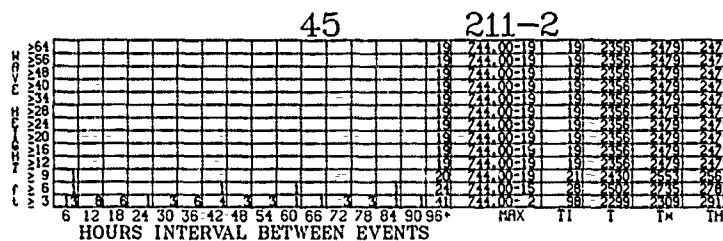
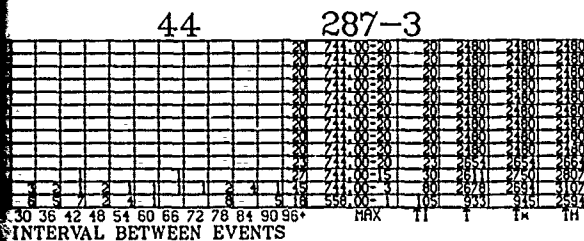
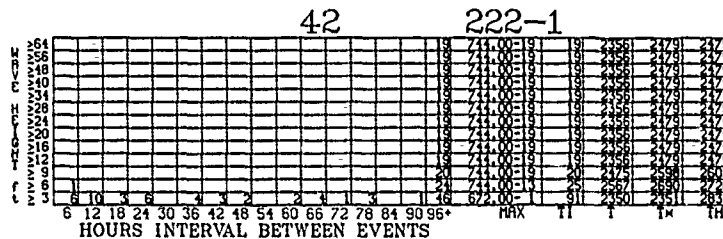
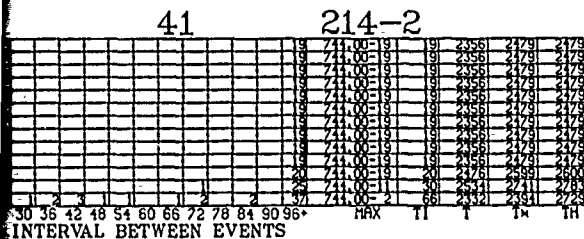
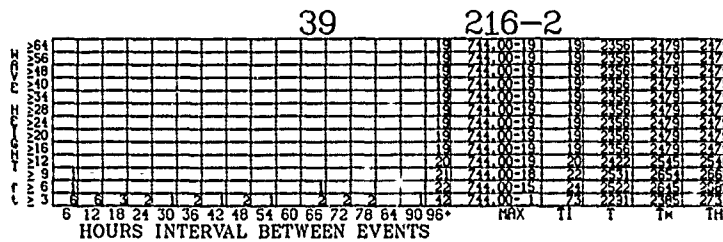
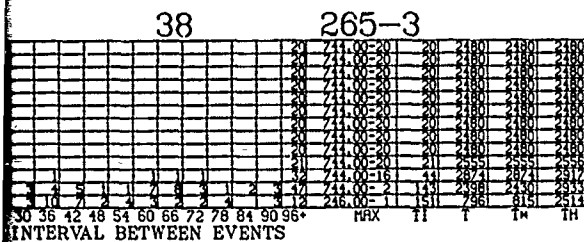


# AUGUST

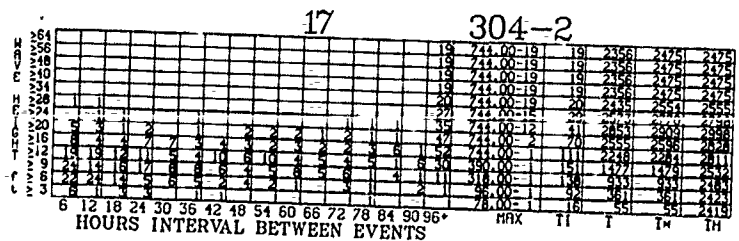
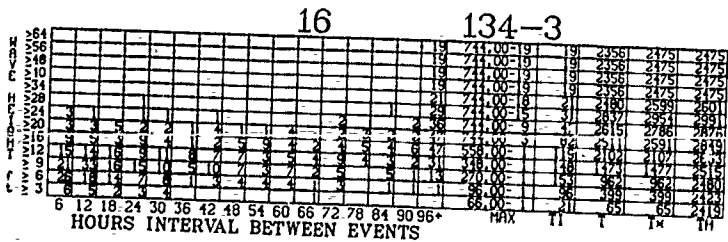
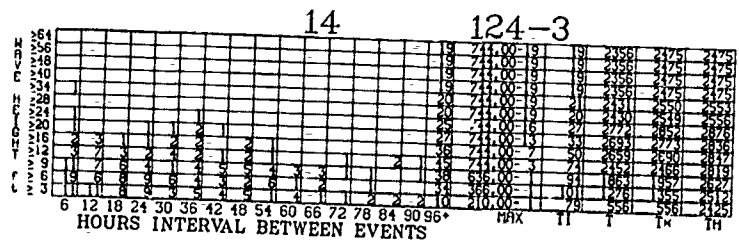
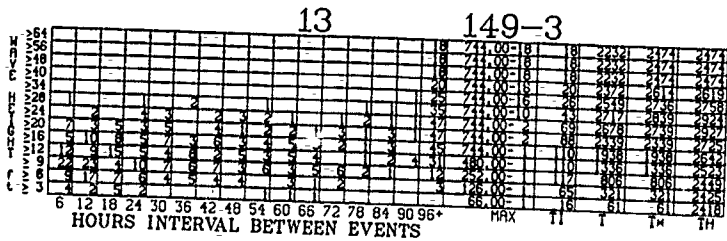
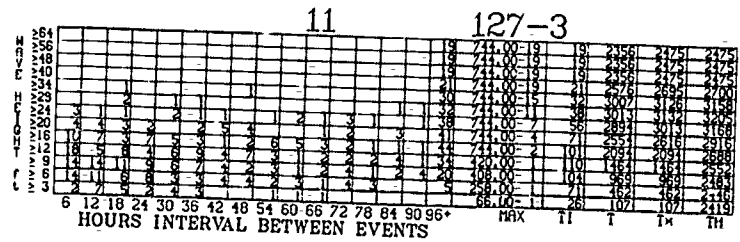
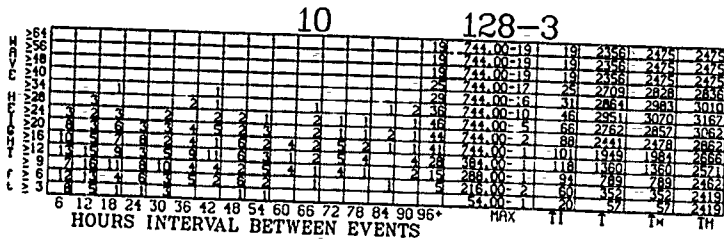
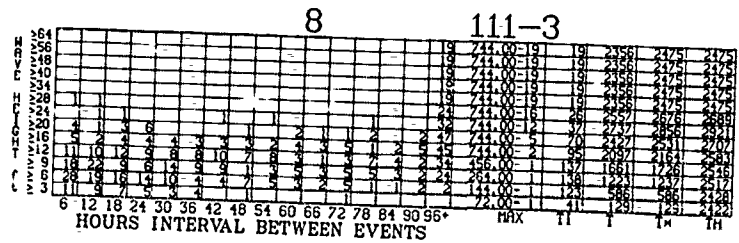
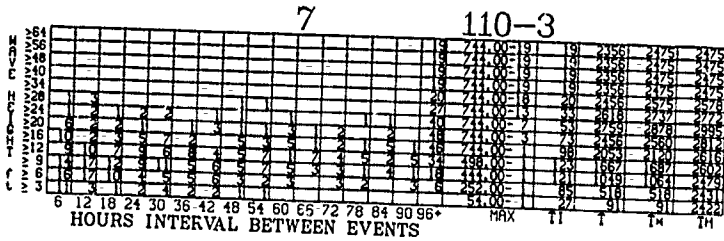
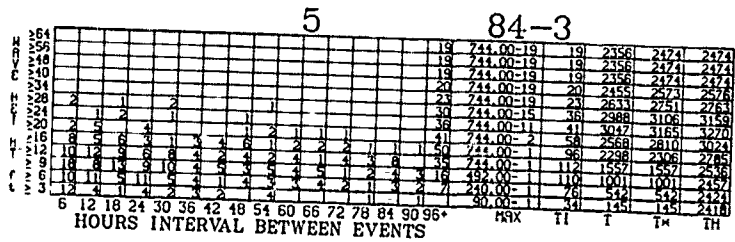
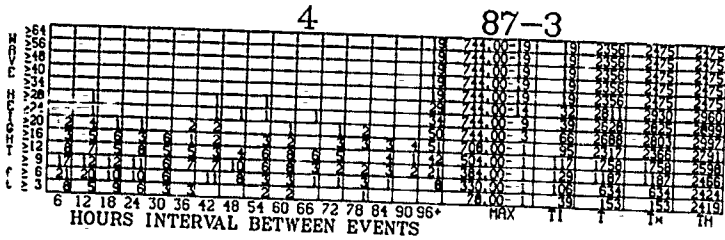
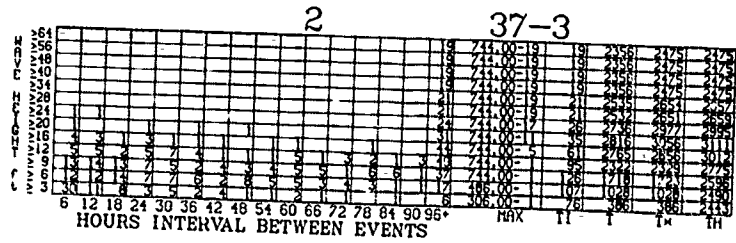
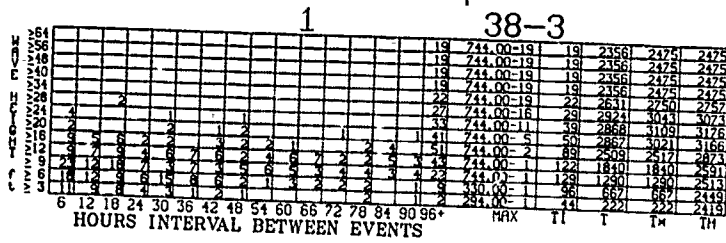
# WAV



## WAVE HEIGHT INTERVALS (Cont'd)

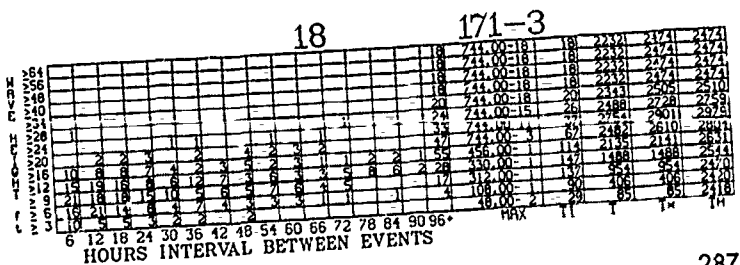
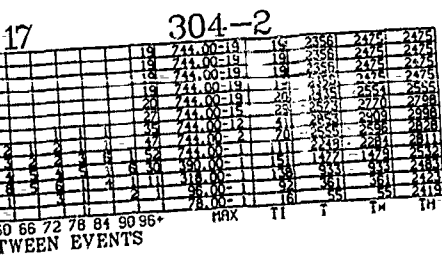
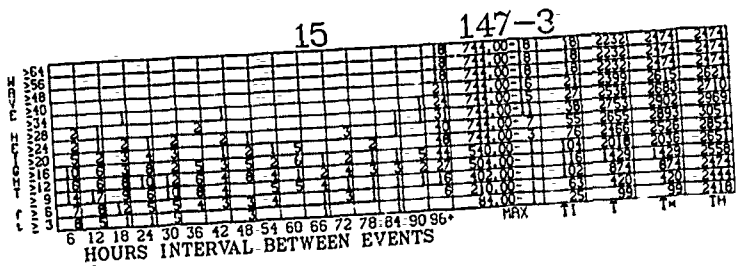
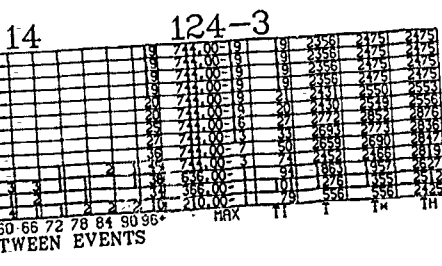
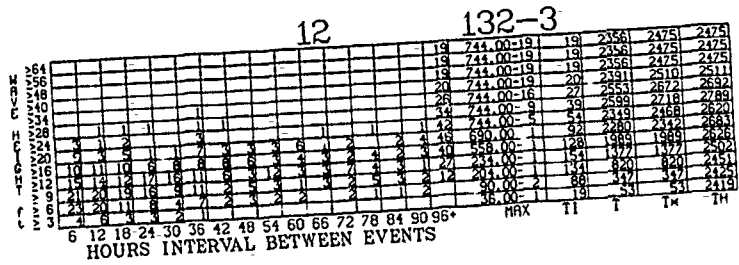
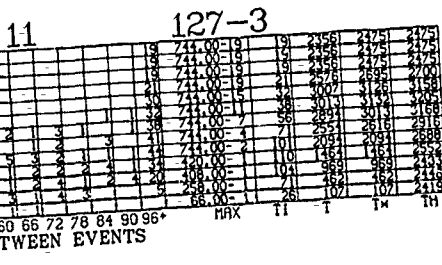
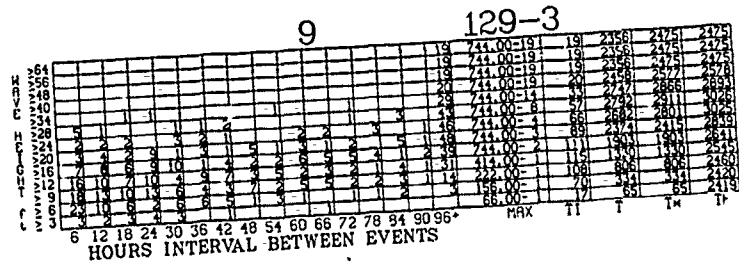
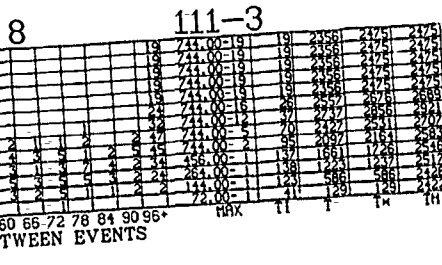
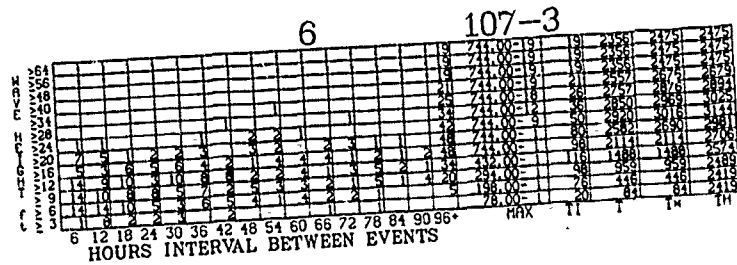
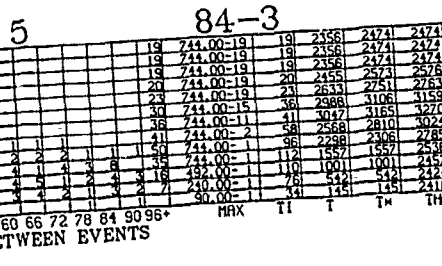
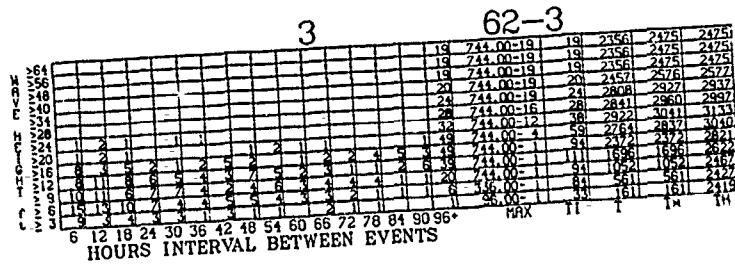
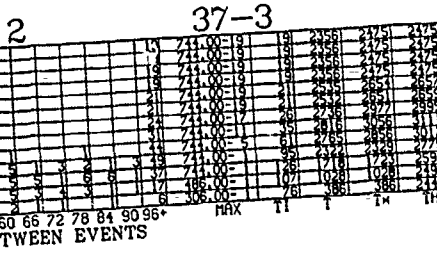


# WAVE HEIGHT INTERVALS





# OCTOBER

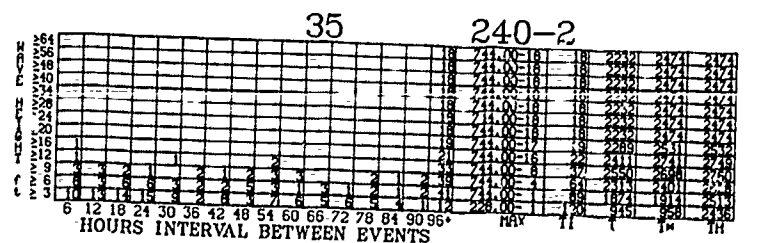
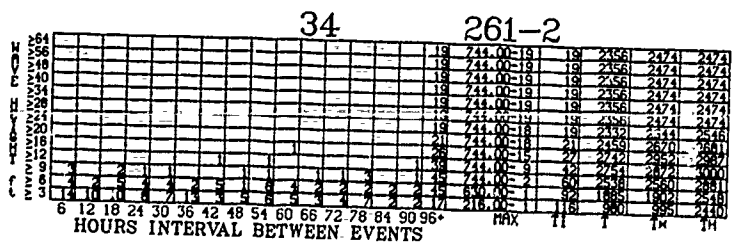
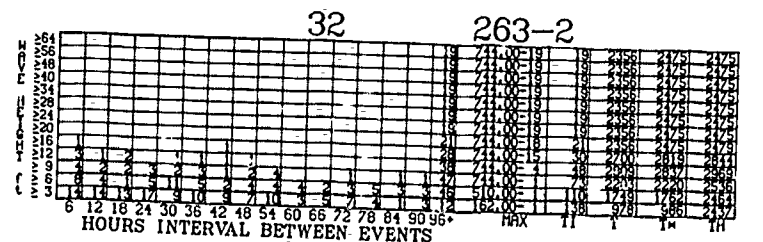
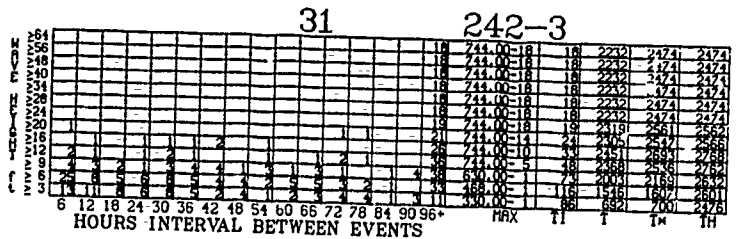
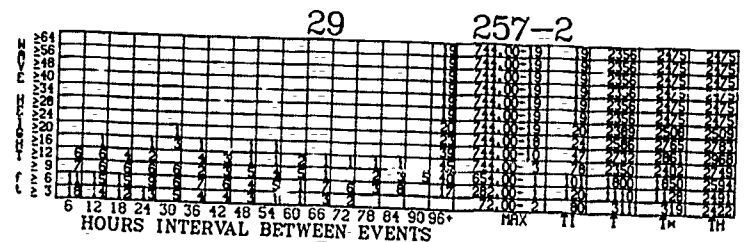
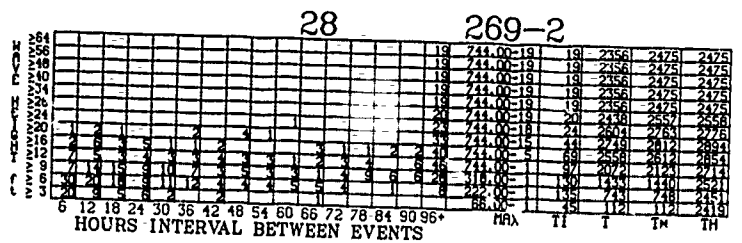
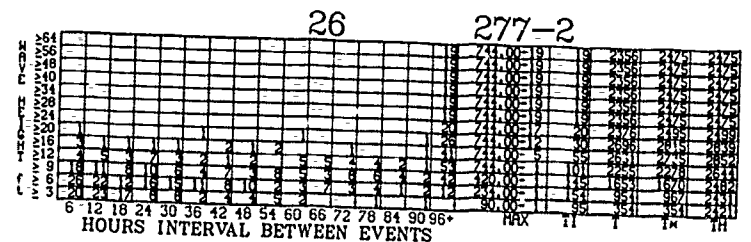
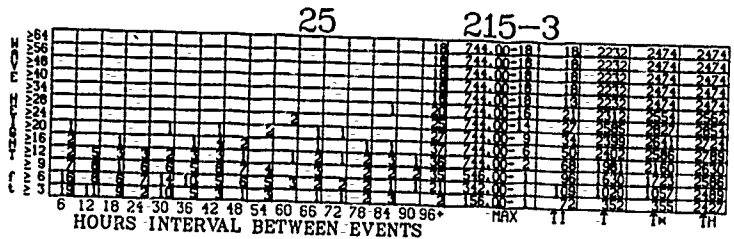
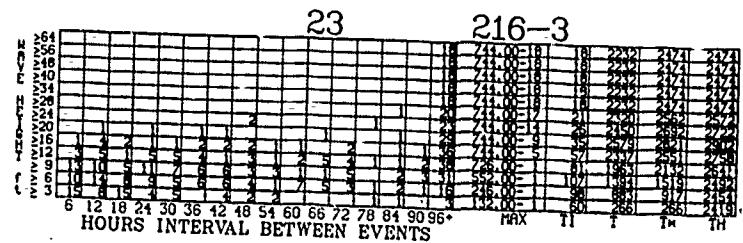
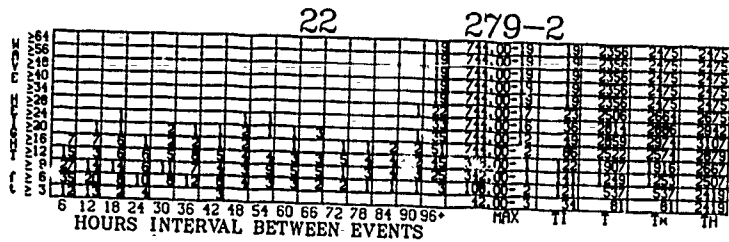
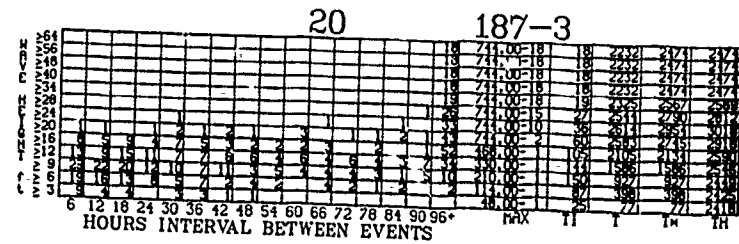
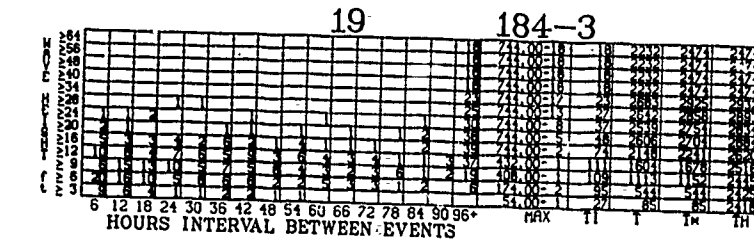


2

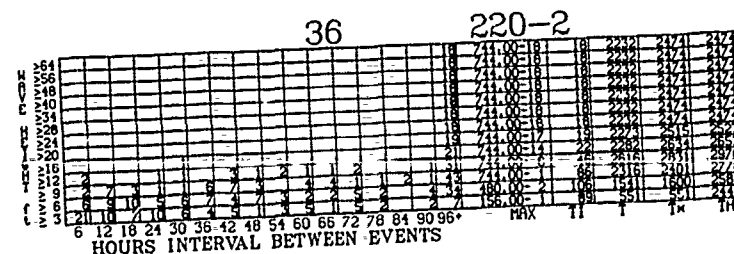
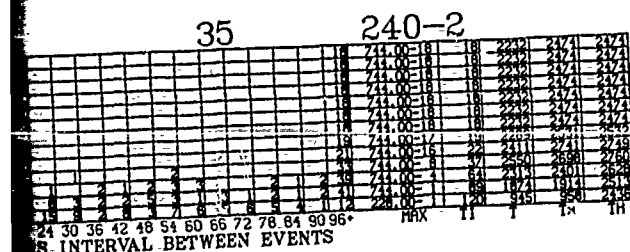
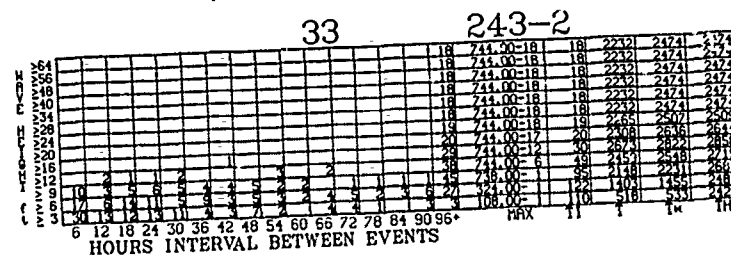
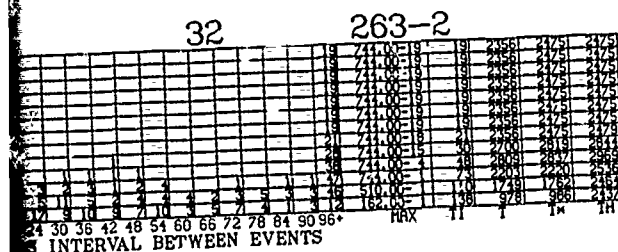
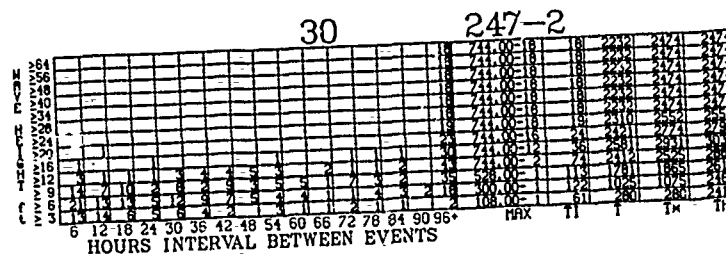
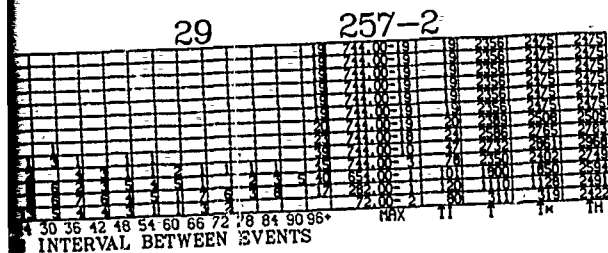
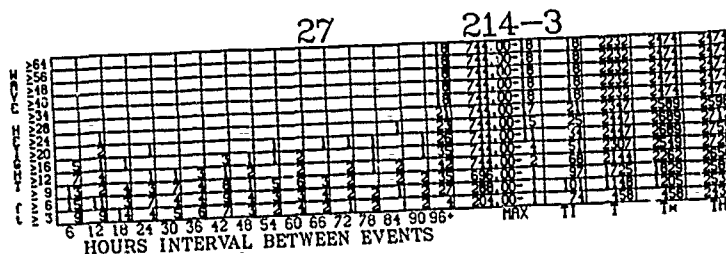
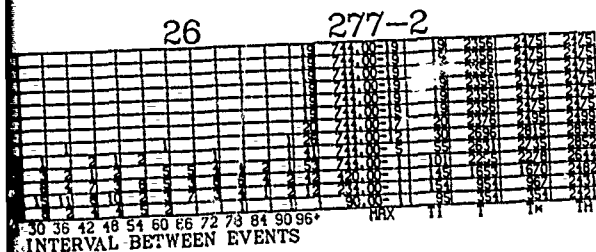
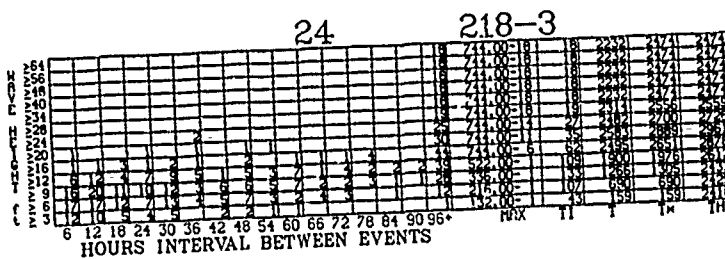
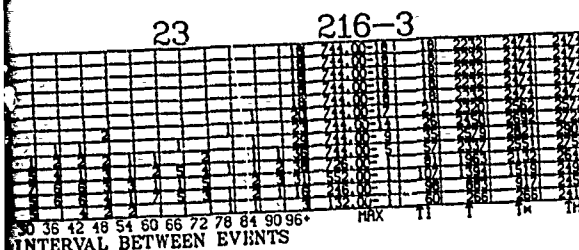
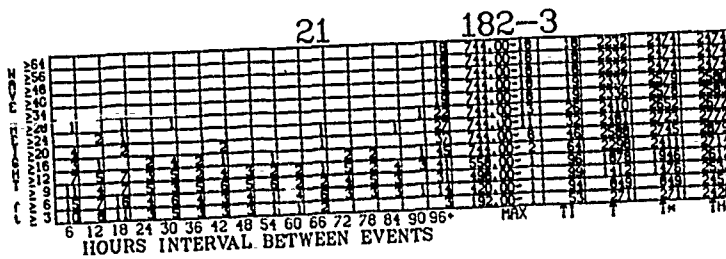
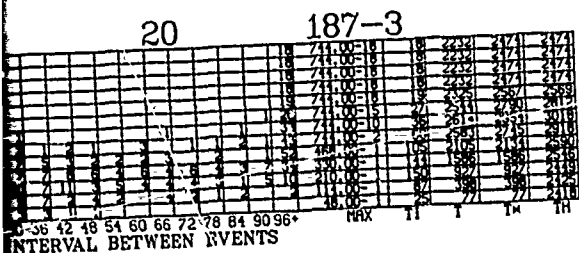


# OCTOBER

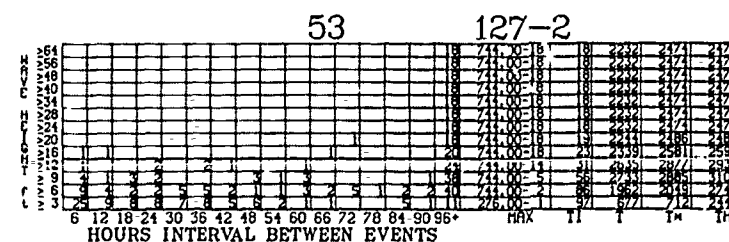
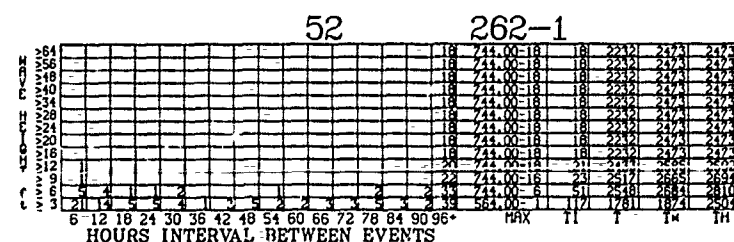
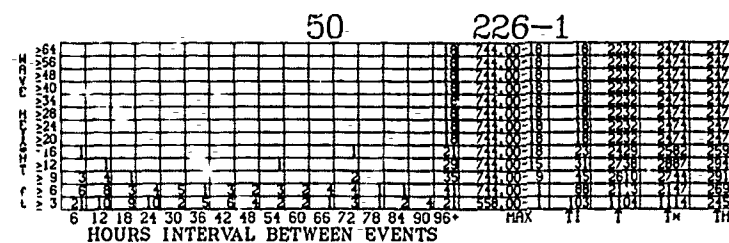
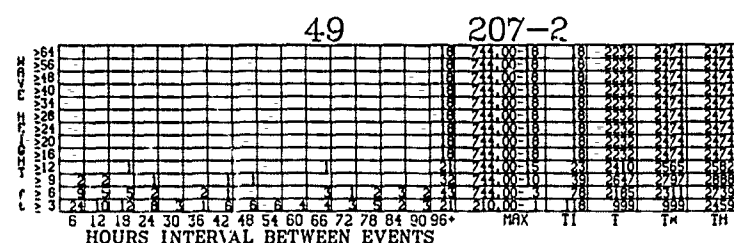
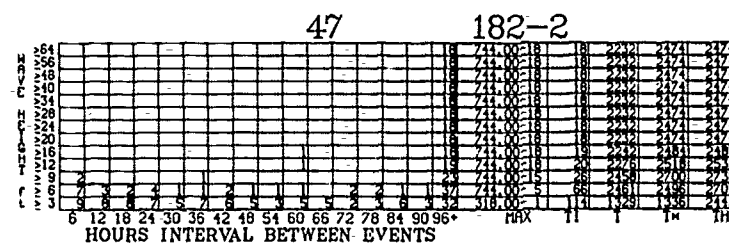
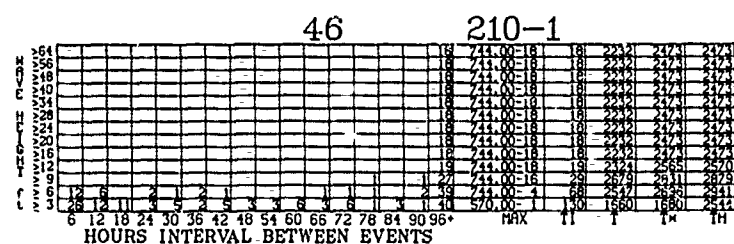
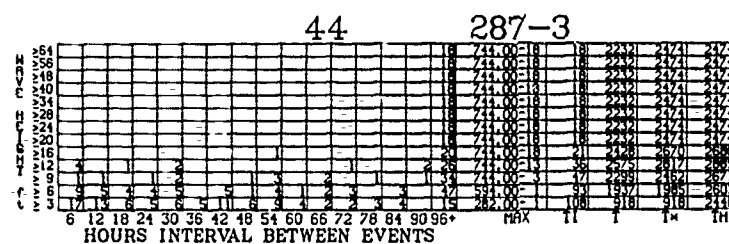
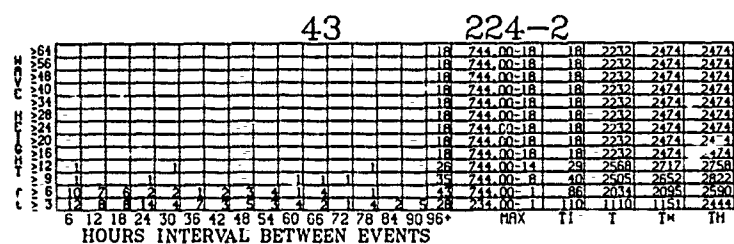
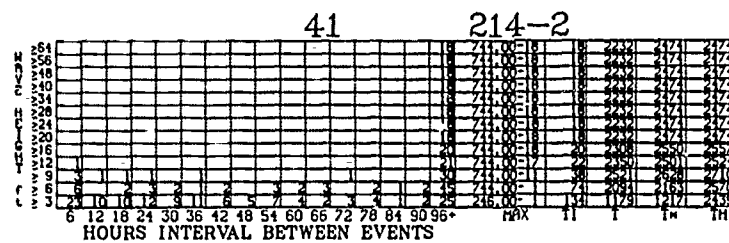
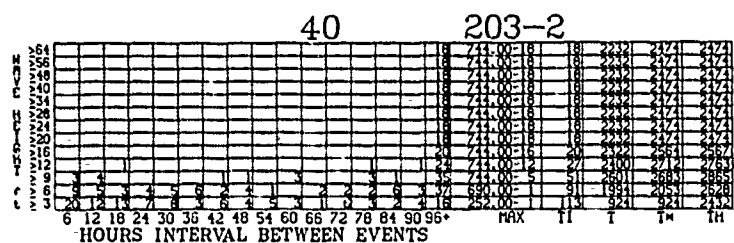
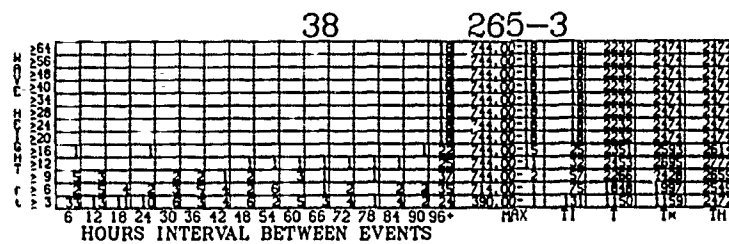
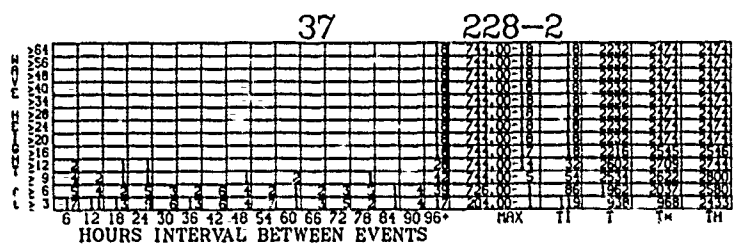
WA



# WAVE HEIGHT INTERVALS (Cont'd)

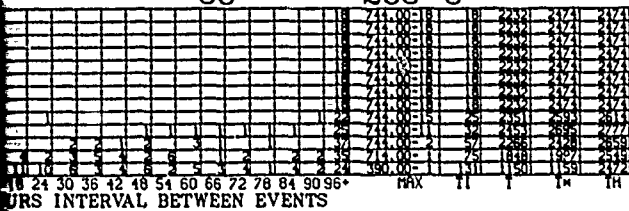


# WAVE HEIGHT INTERVALS (Cont'd)

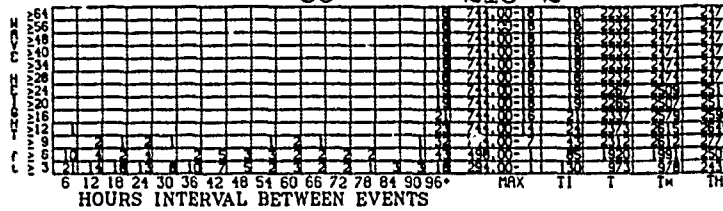


# OCTOBER

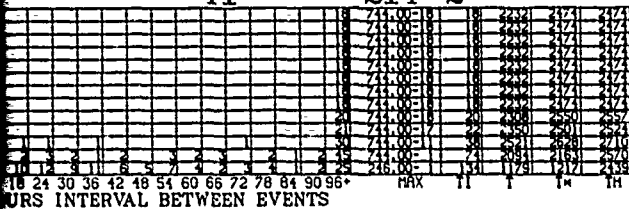
38 265-3



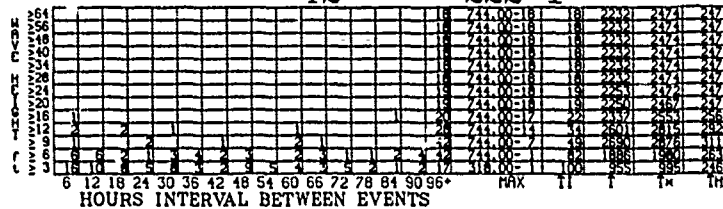
39 216-2



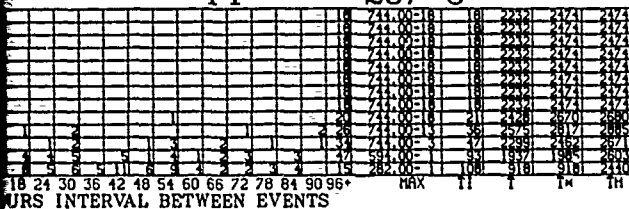
41 214-2



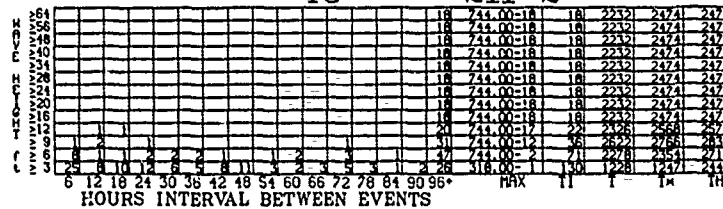
42 222-1



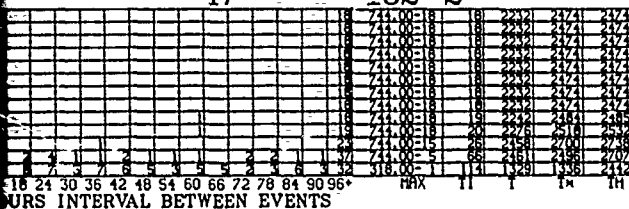
44 287-3



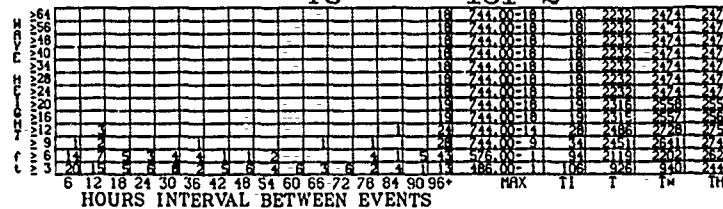
45 211-2



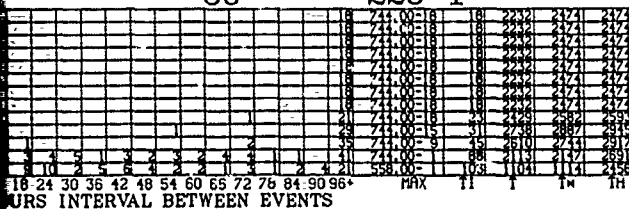
47 182-2



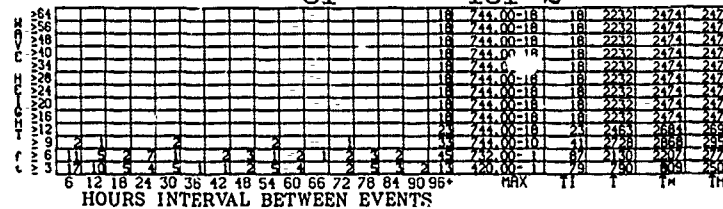
48 151-2



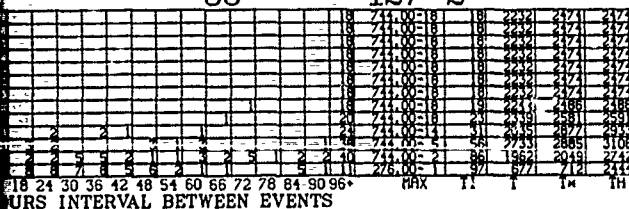
50 226-1



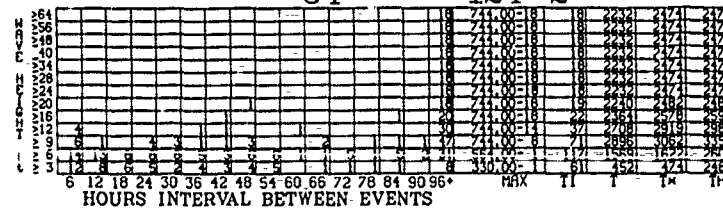
51 161-2



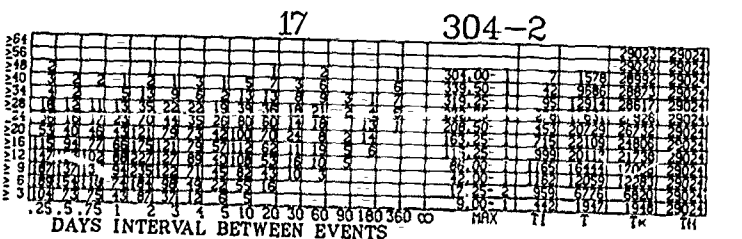
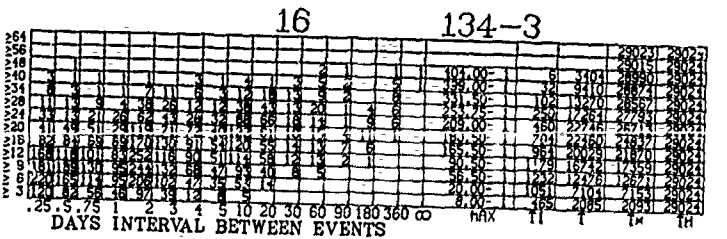
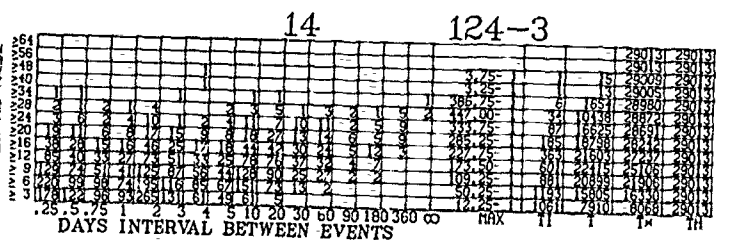
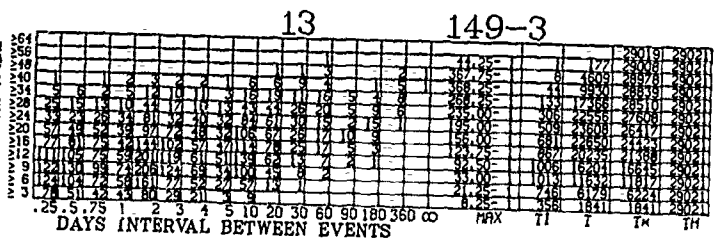
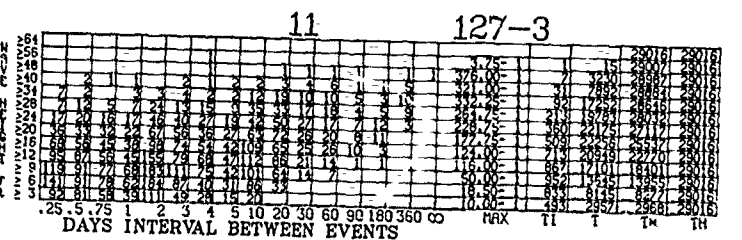
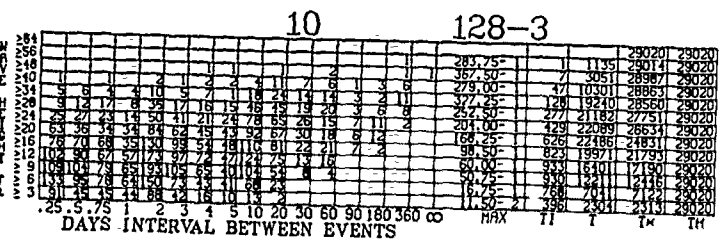
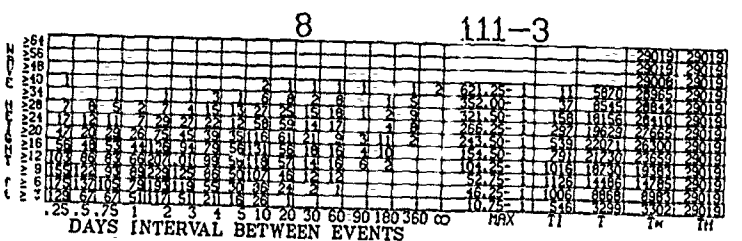
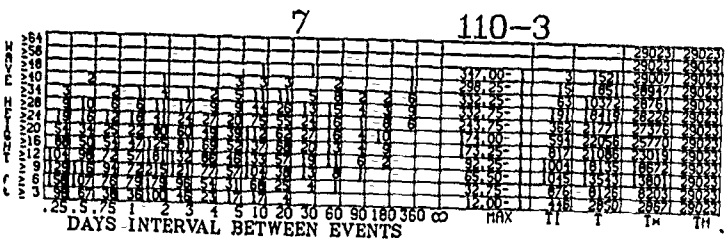
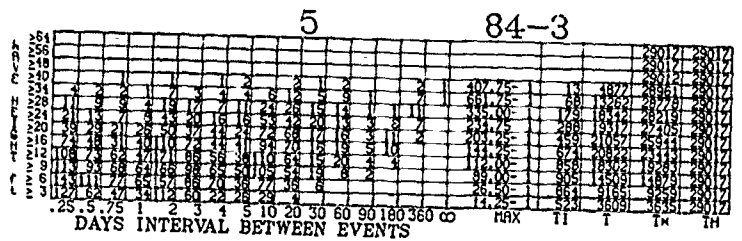
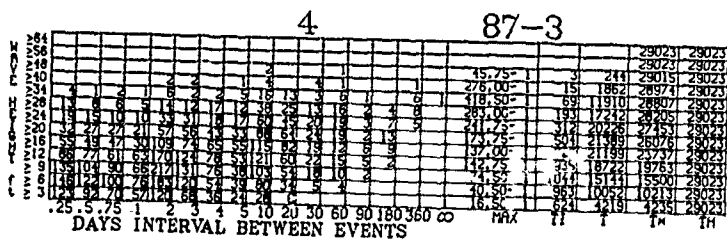
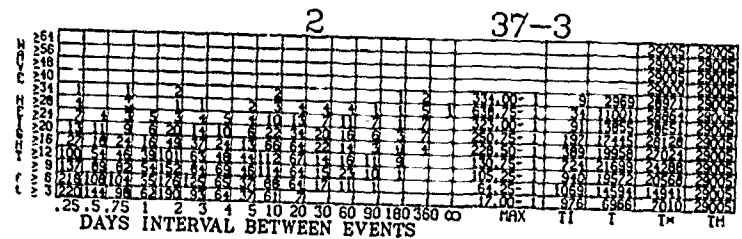
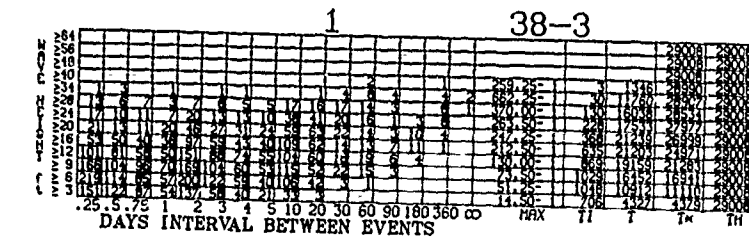
53 127-2



54 124-2



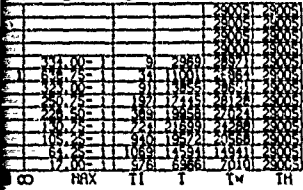
# ALL DAYS





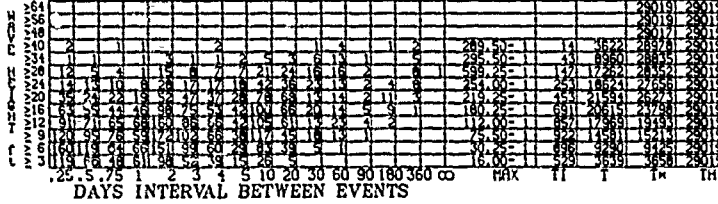
# WAVE HEIGHT INTERVALS

37-3

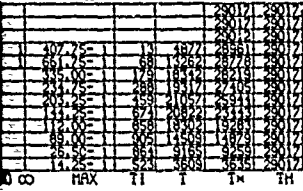


3

62-3

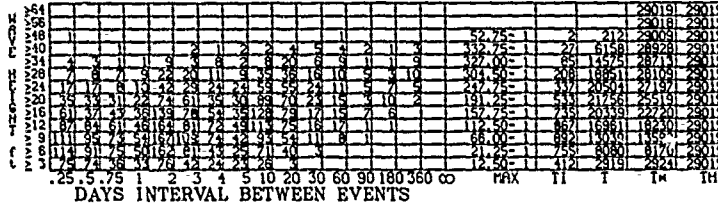


84-3

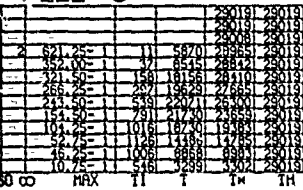


6

107-3

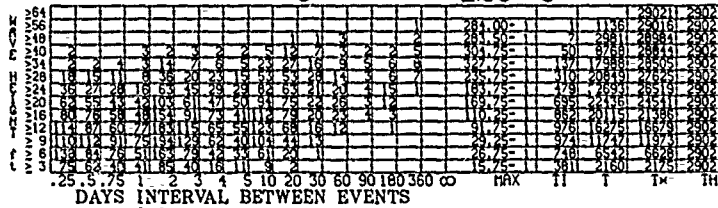


111-3

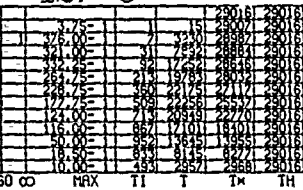


9

129-3

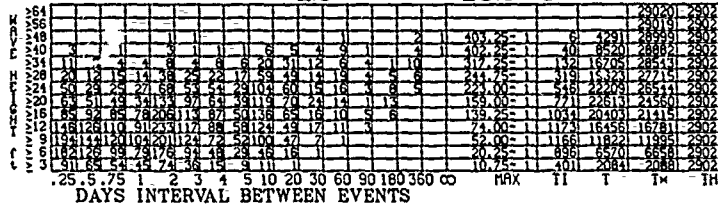


127-3

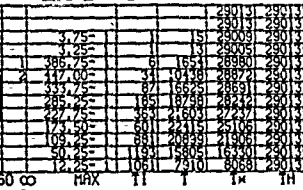


12

132-3

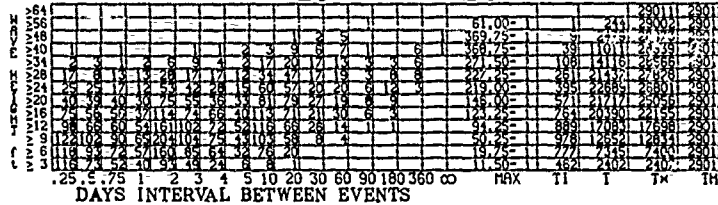


124-3

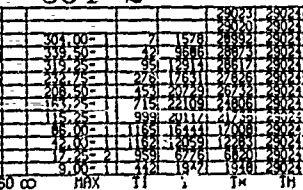


15

147-3

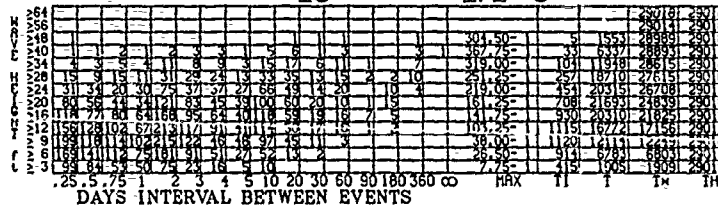


304-2



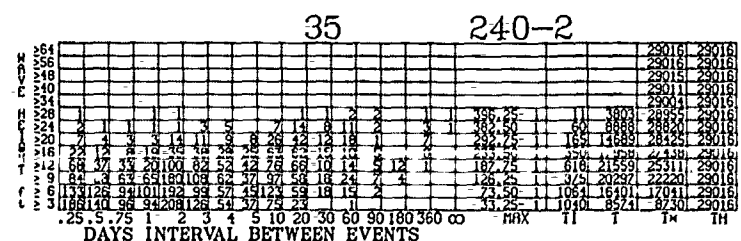
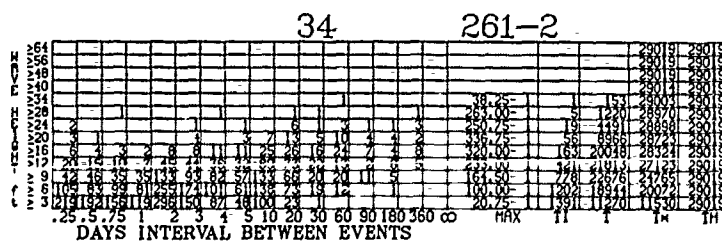
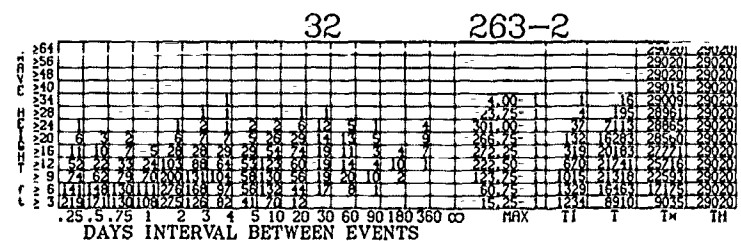
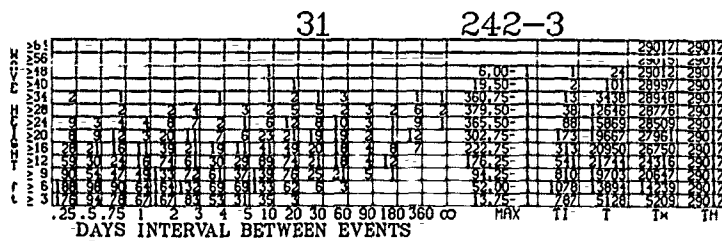
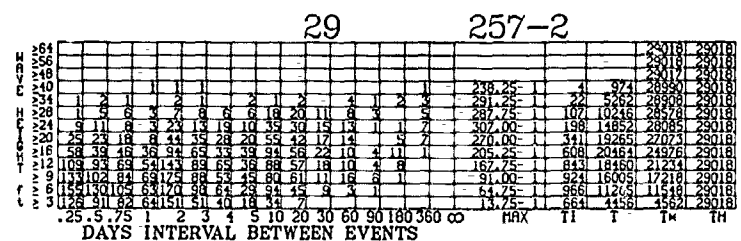
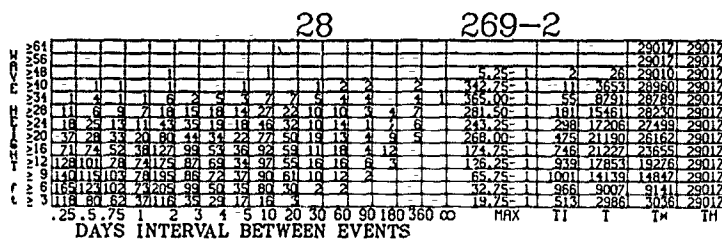
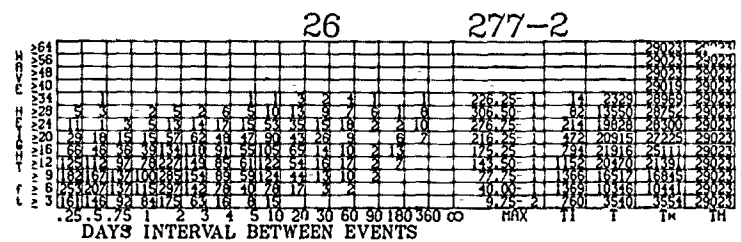
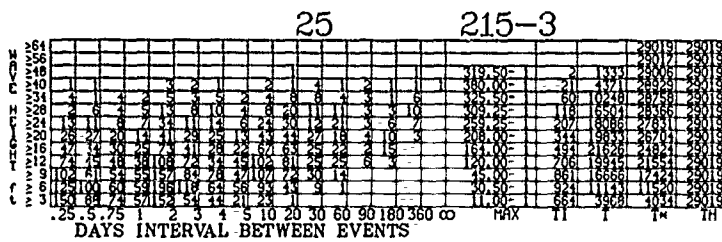
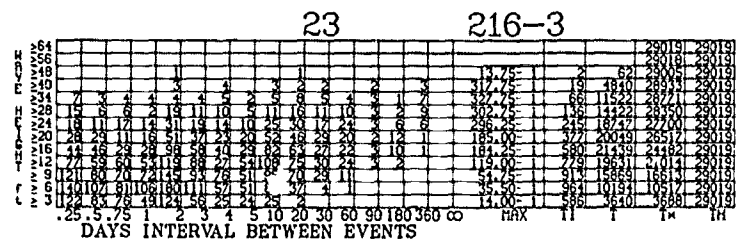
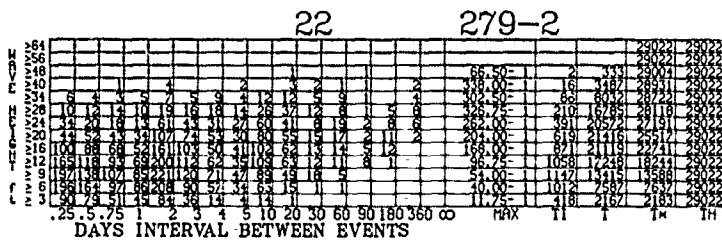
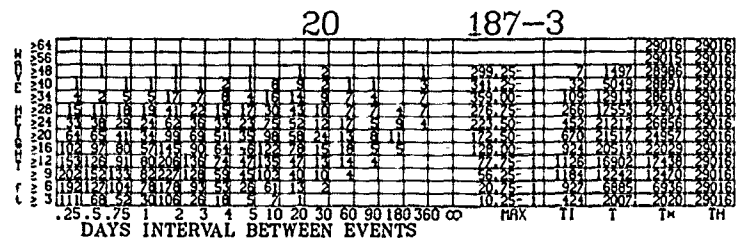
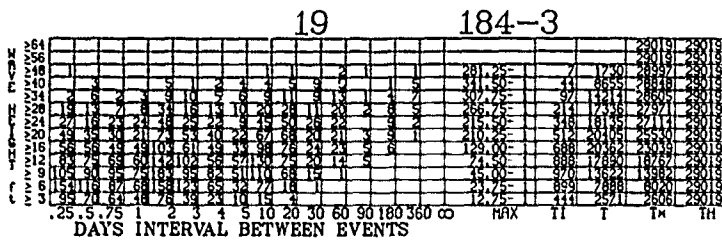
18

171-3





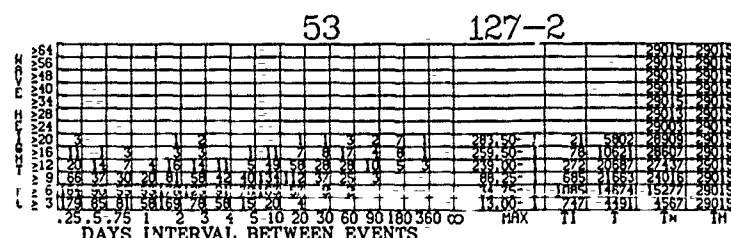
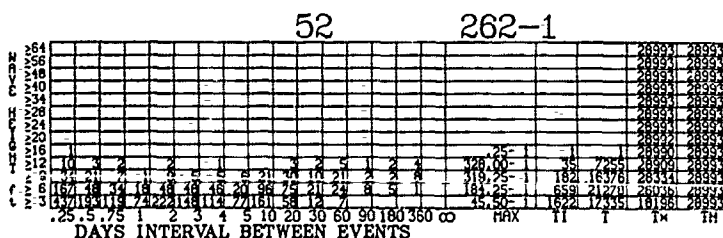
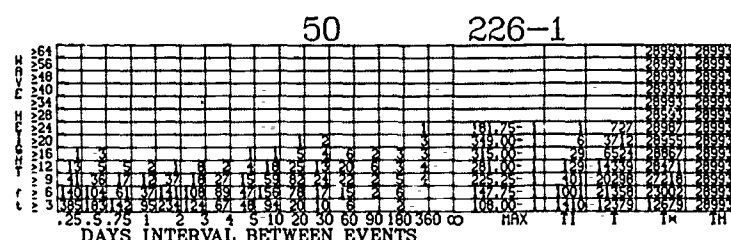
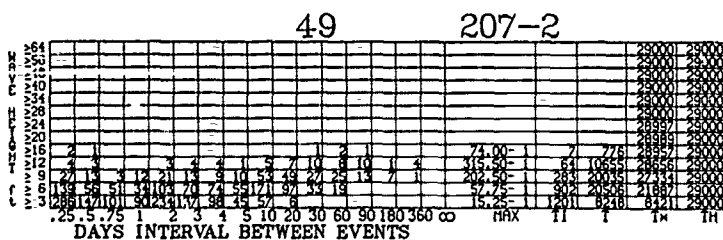
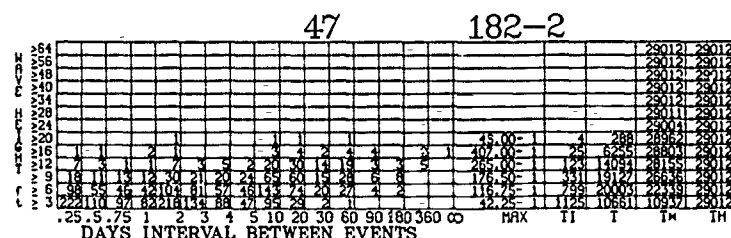
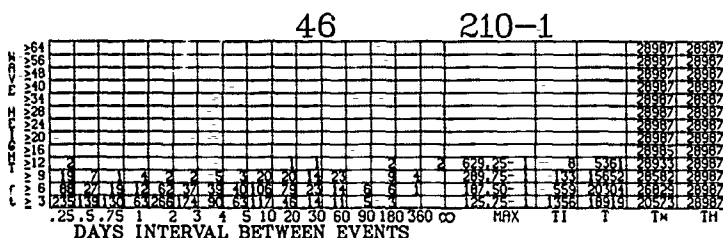
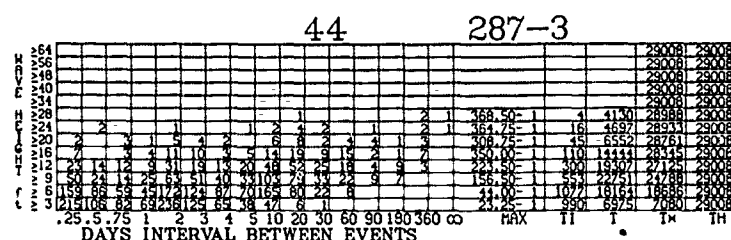
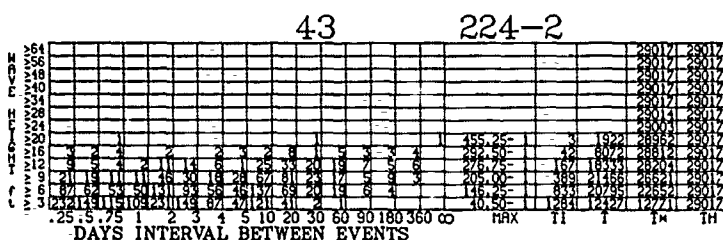
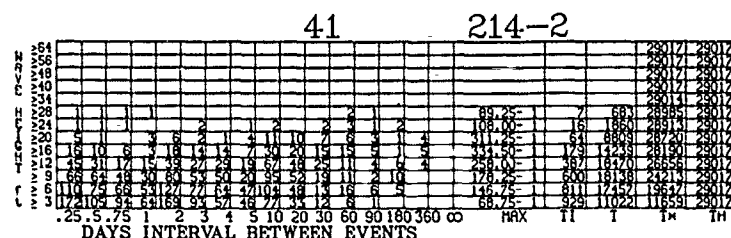
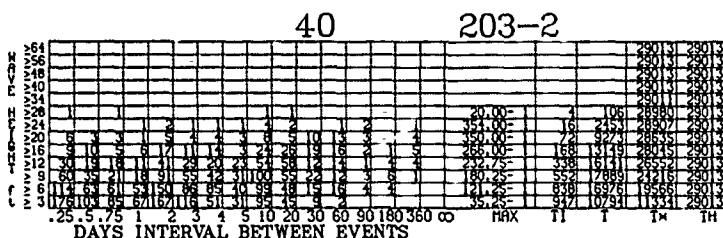
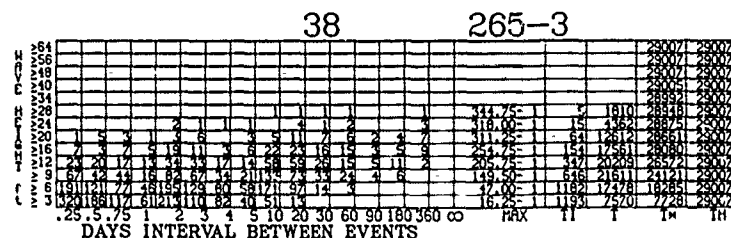
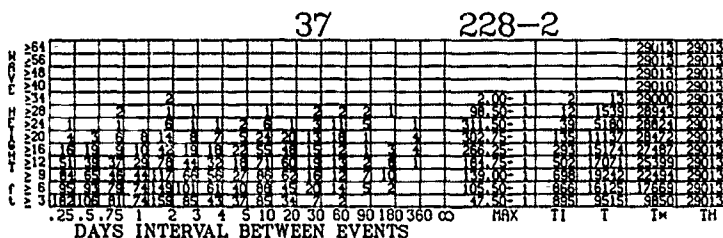
# WAVE HEIGHT INTERVALS (Cont'd)



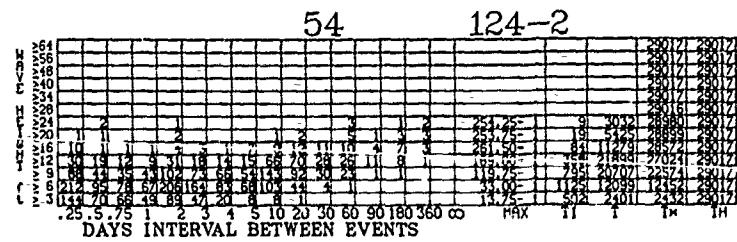
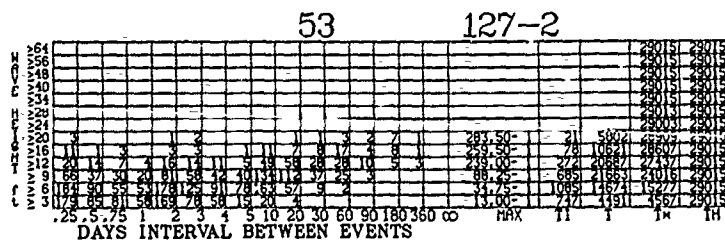
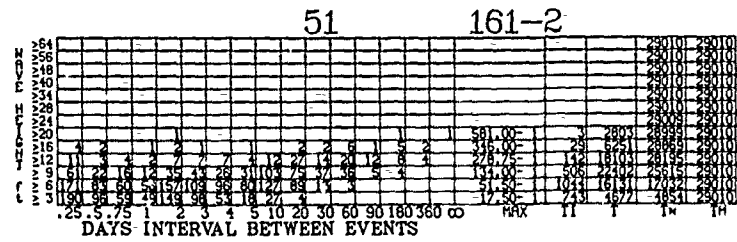
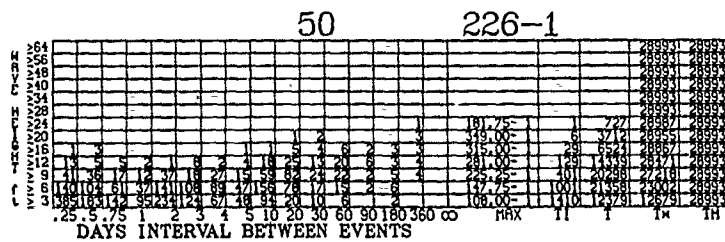
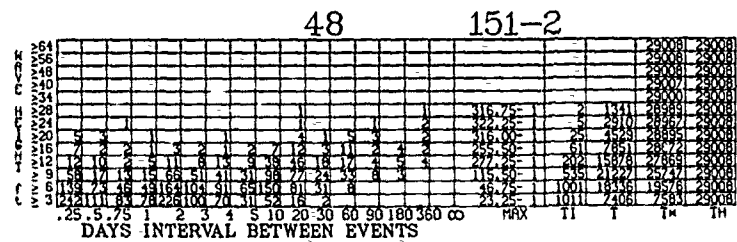
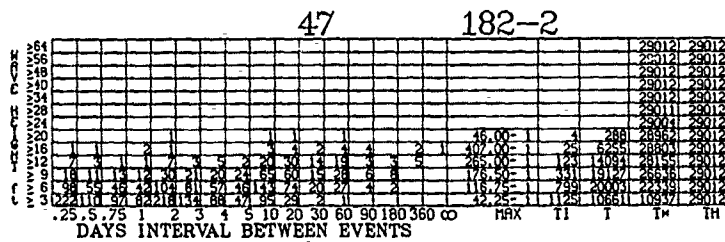
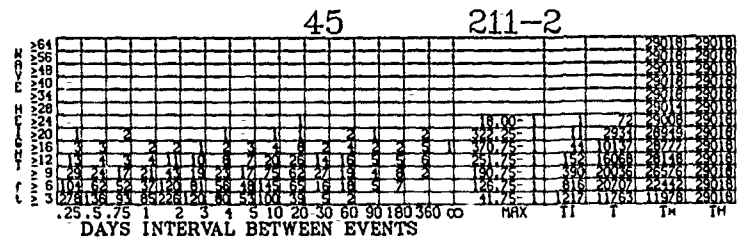
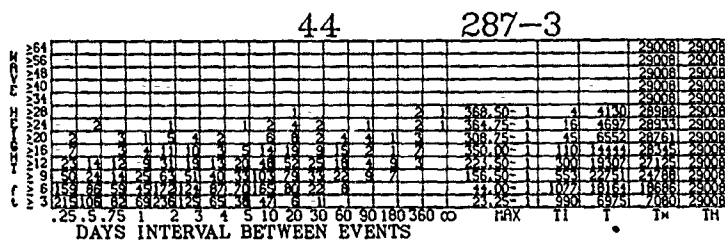
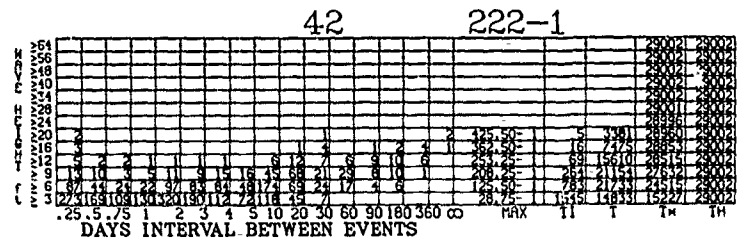
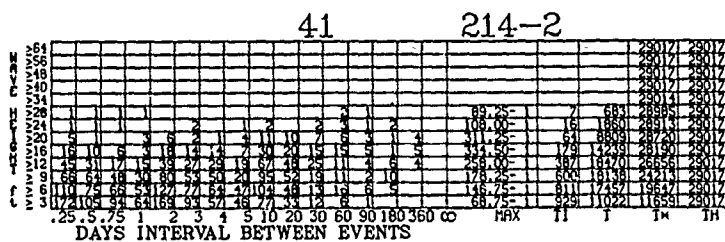
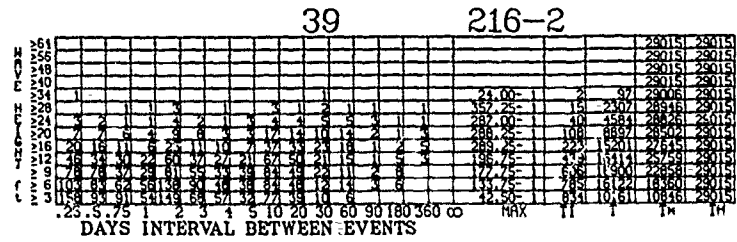
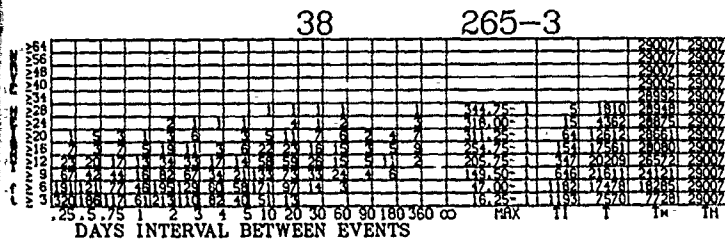


# ALL DAYS

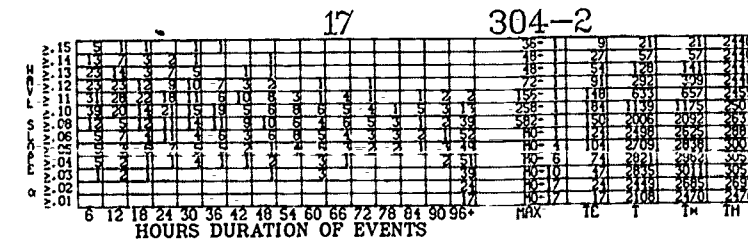
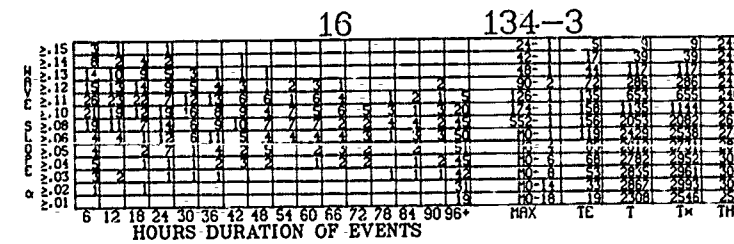
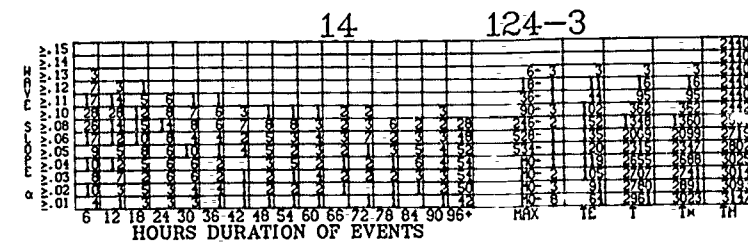
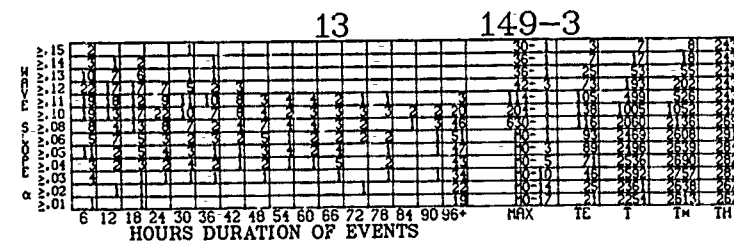
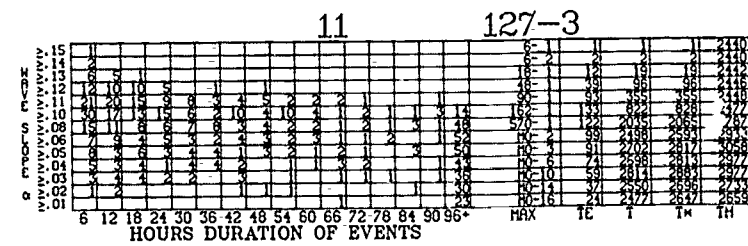
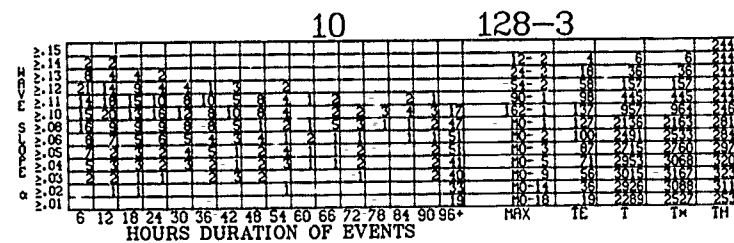
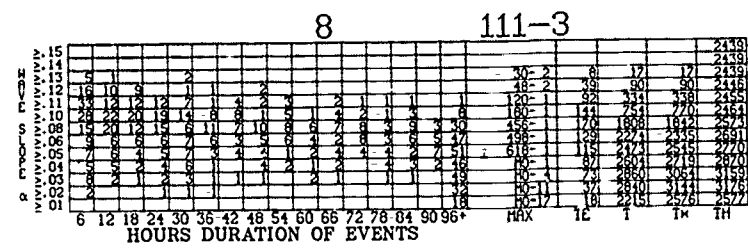
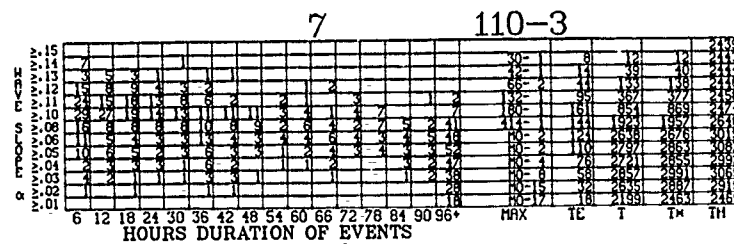
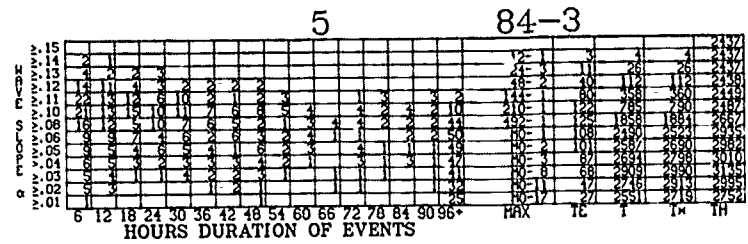
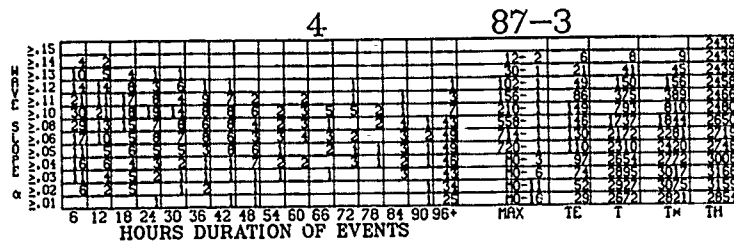
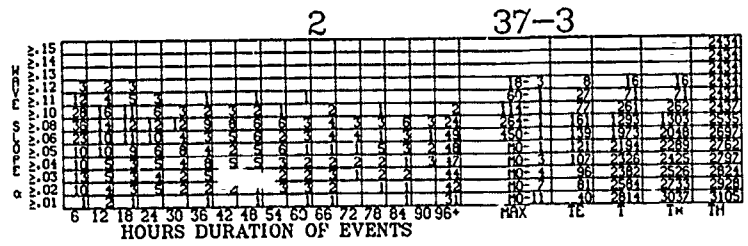
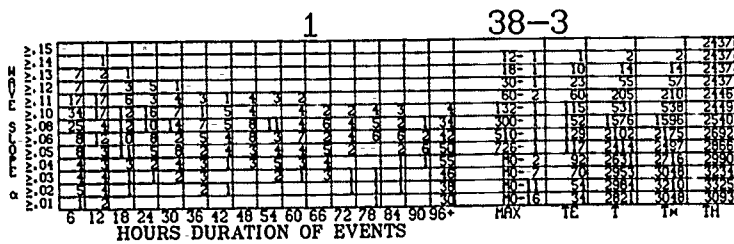
# WAV



# WAVE HEIGHT INTERVALS (Cont'd)



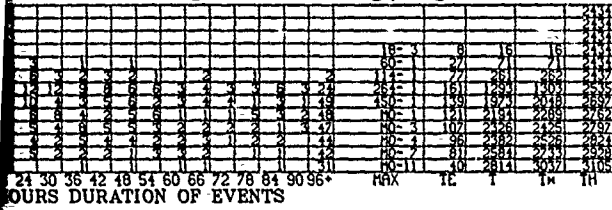
# WAVE SLOPE ( $\alpha$ ) DURATIONS



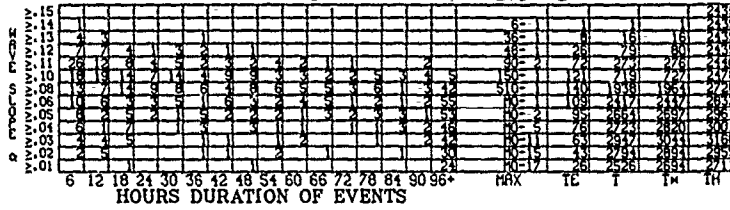


# JANUARY

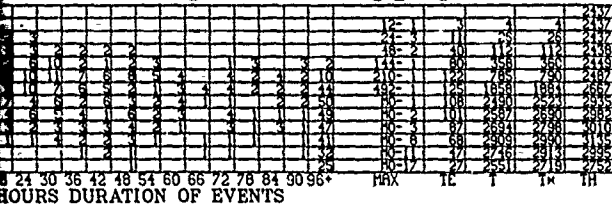
2 37-3



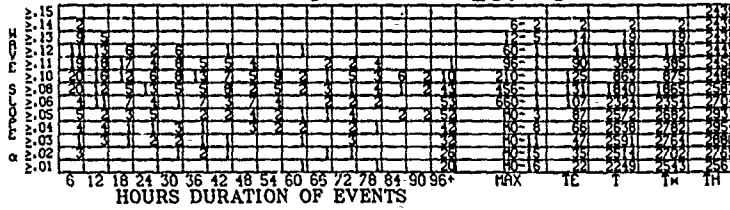
3 62-3



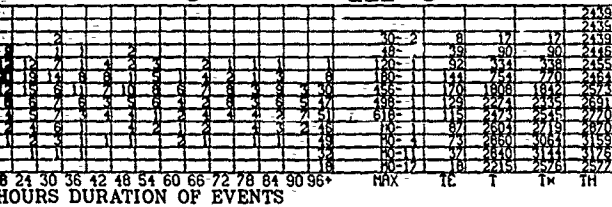
5 84-3



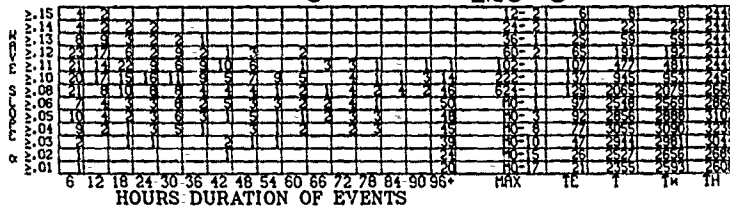
6 107-3



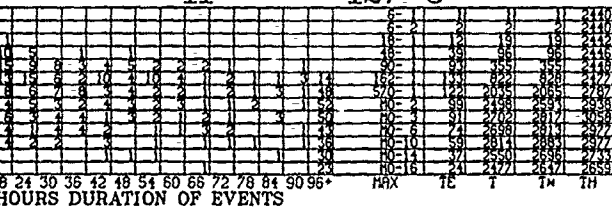
8 111-3



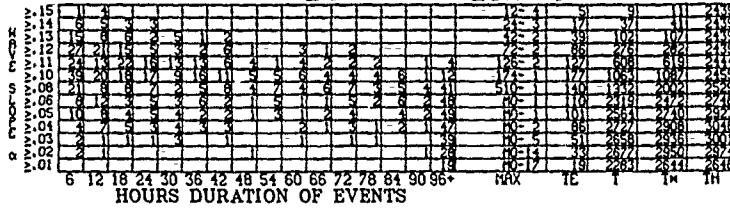
9 129-3



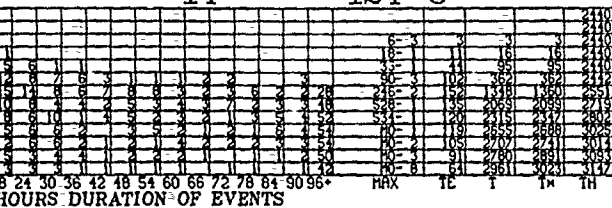
11 127-3



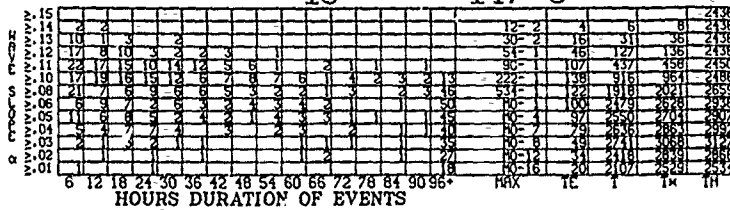
12 132-3



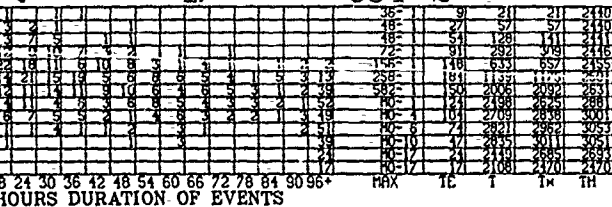
14 124-3



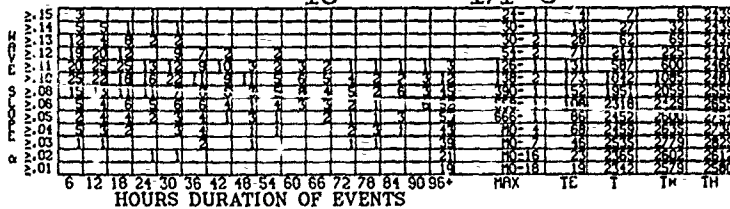
15 147-3



17 304-2



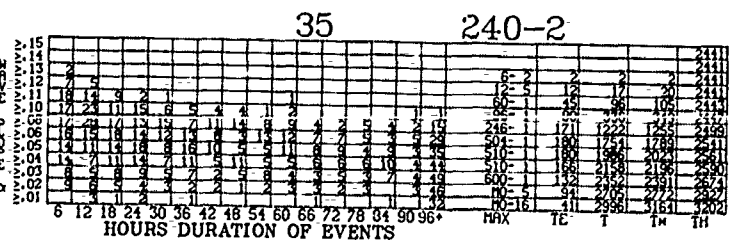
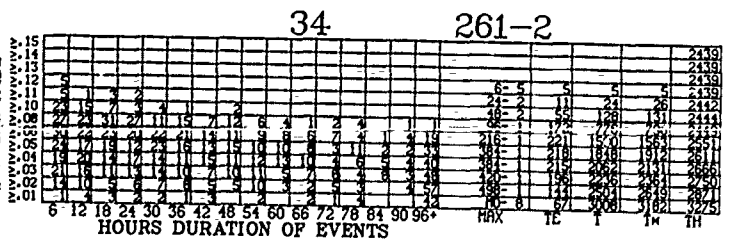
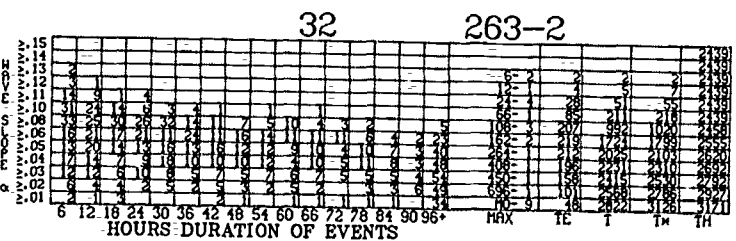
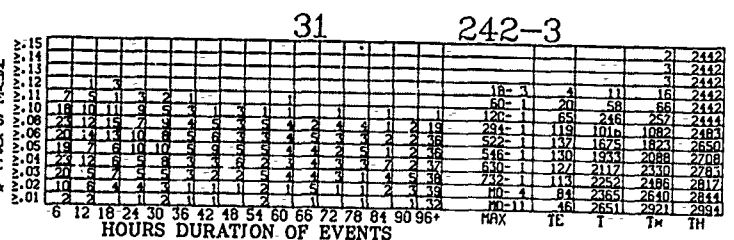
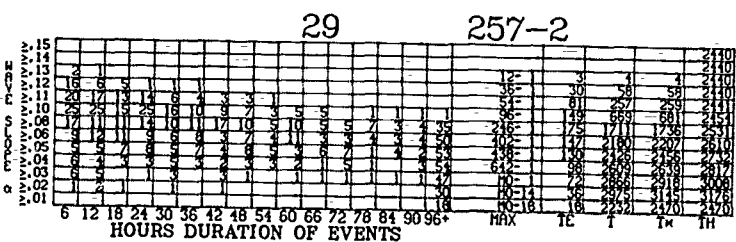
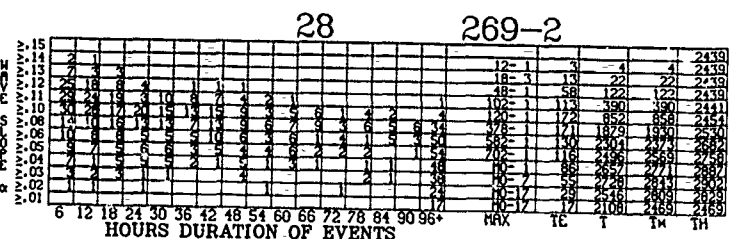
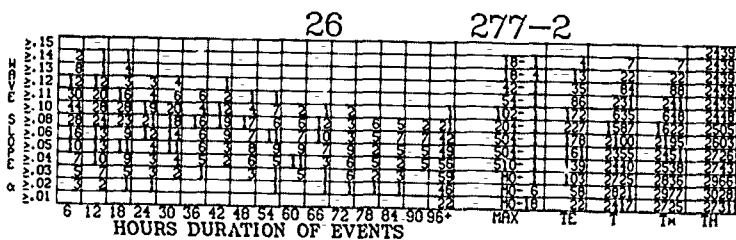
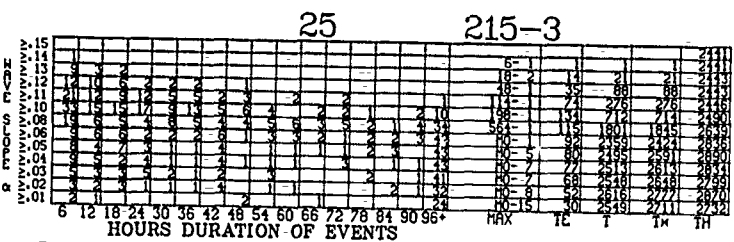
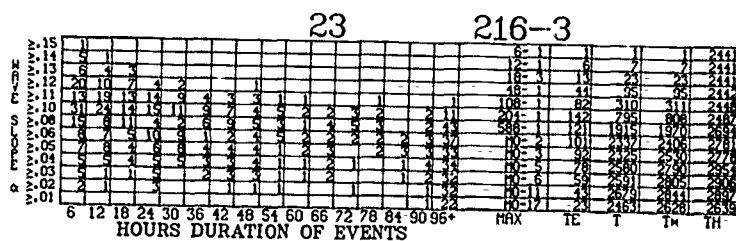
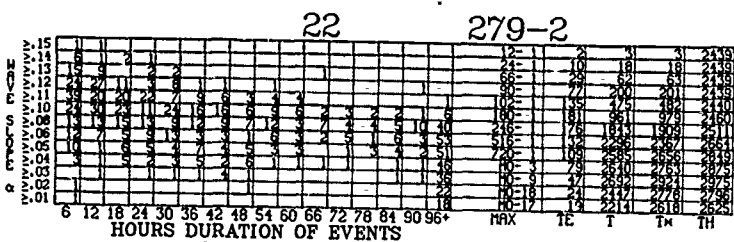
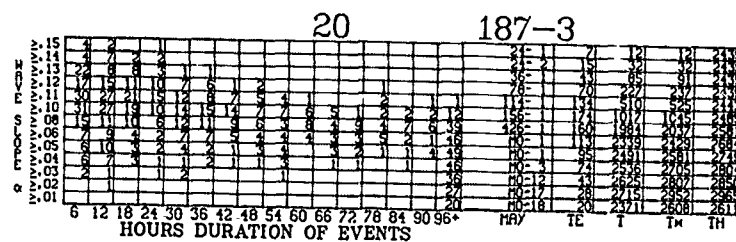
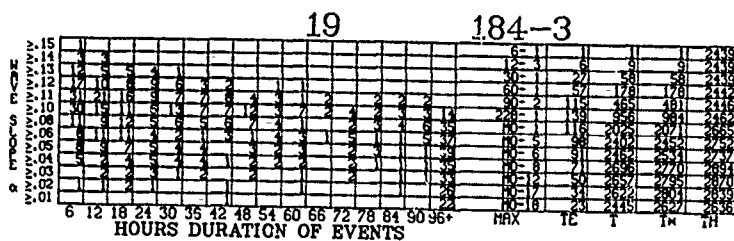
18 171-3



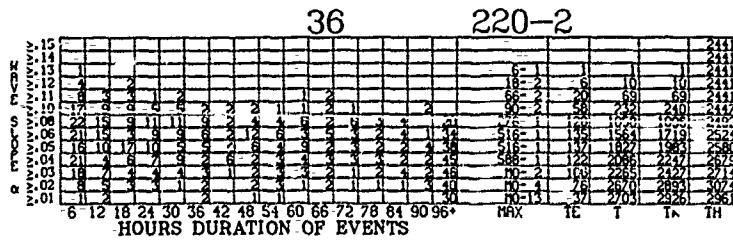
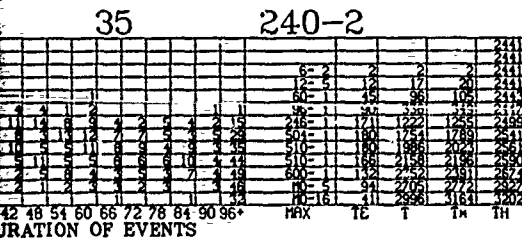
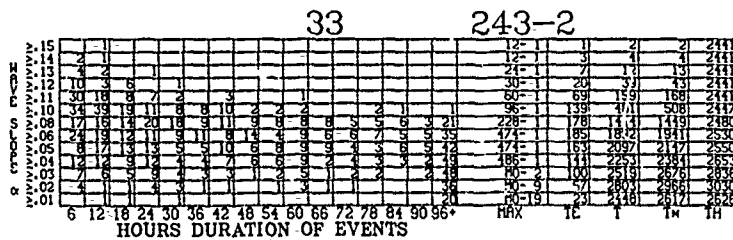
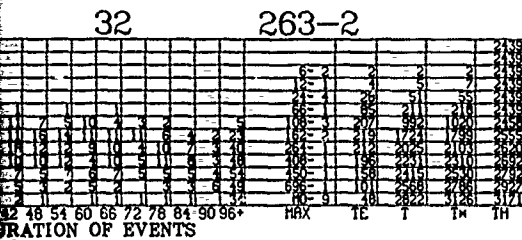
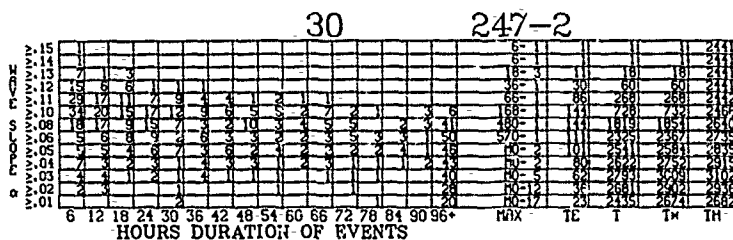
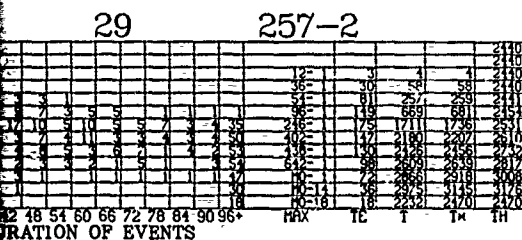
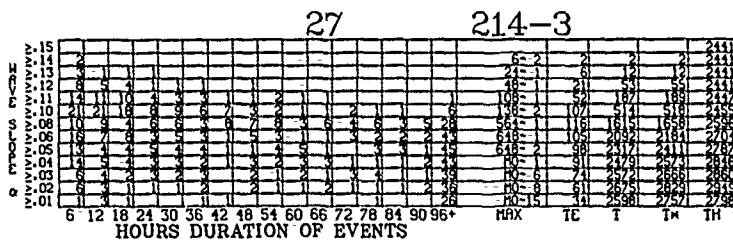
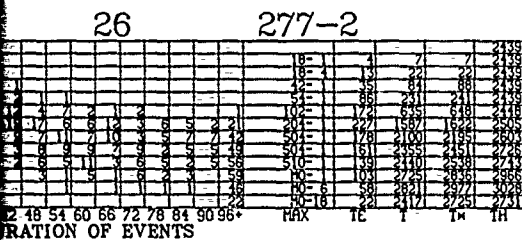
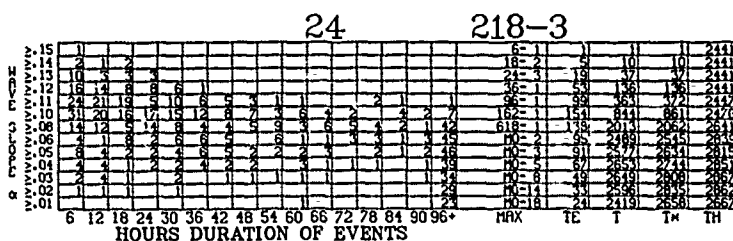
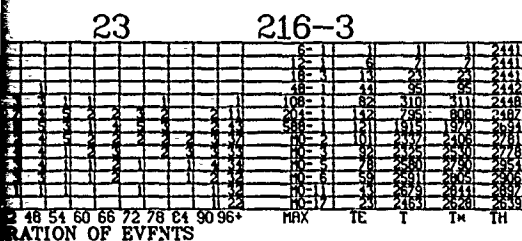
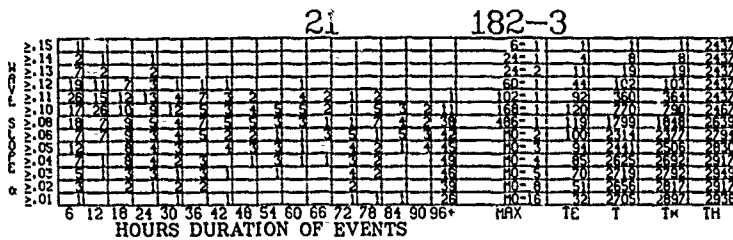
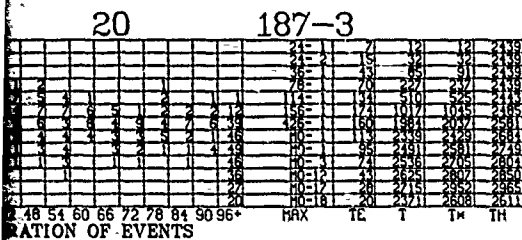


# JANUARY

# WAVE S

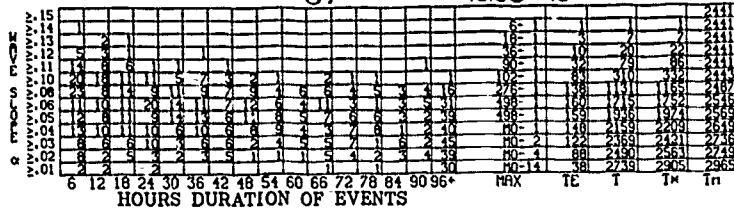


# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)

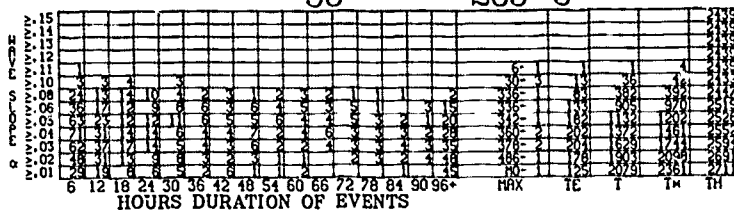


# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)

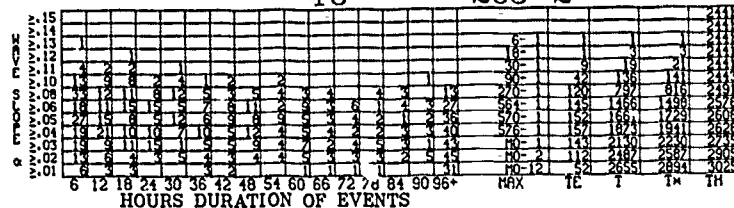
37 228-2



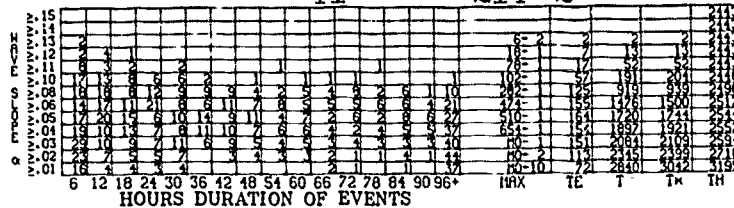
38 265-3



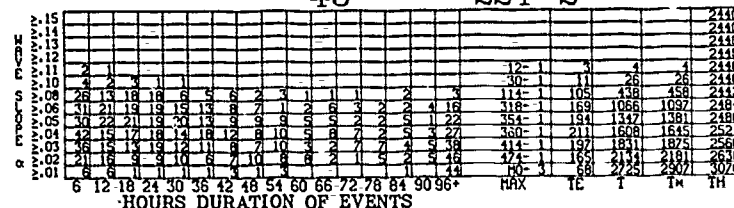
40 203-2



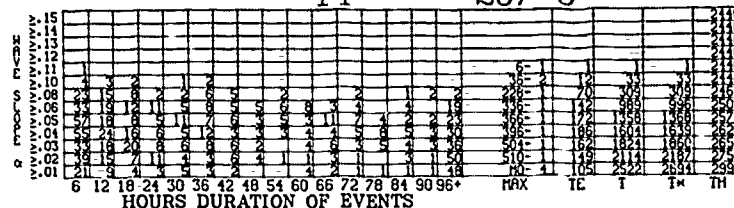
41 214-2



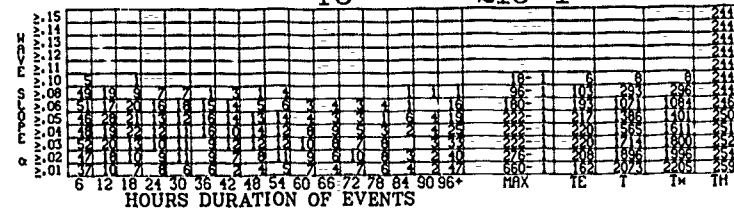
43 224-2



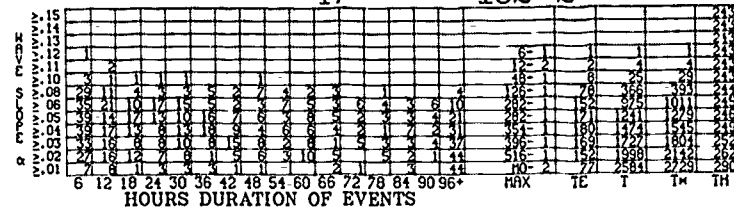
44 287-3



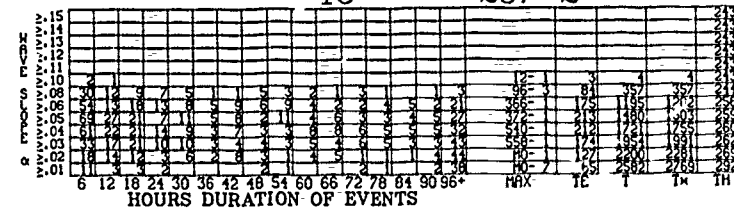
46 210-1



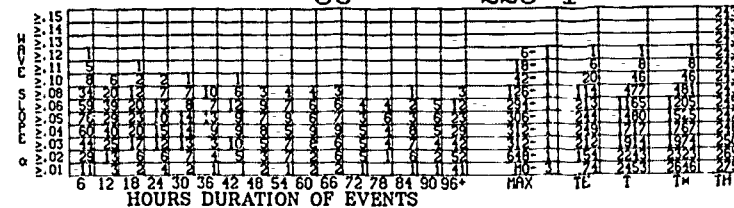
47 182-2



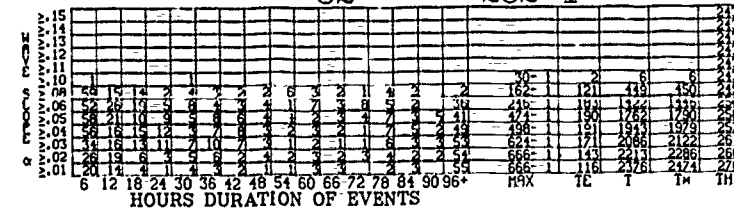
49 207-2



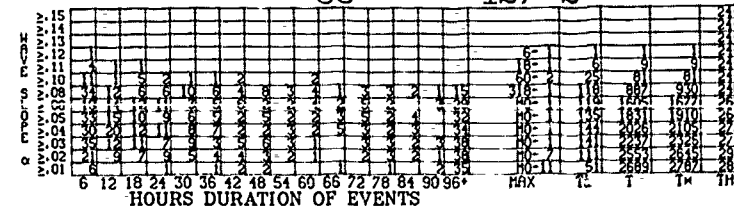
50 226-1



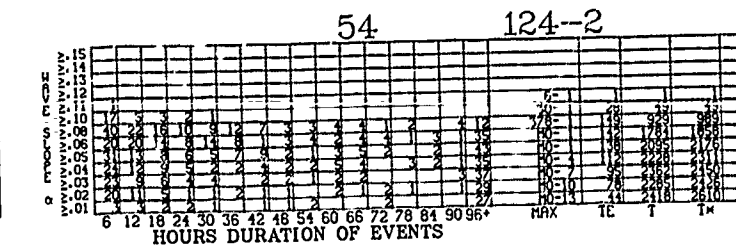
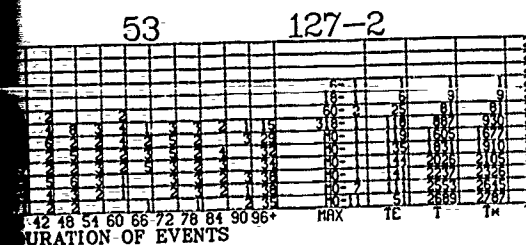
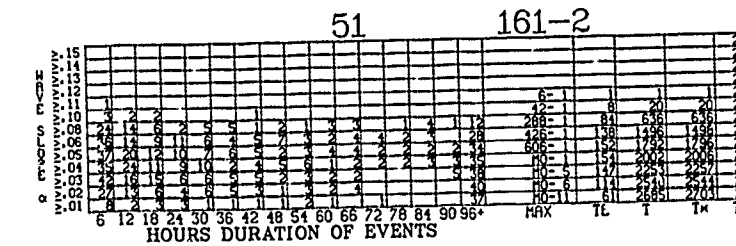
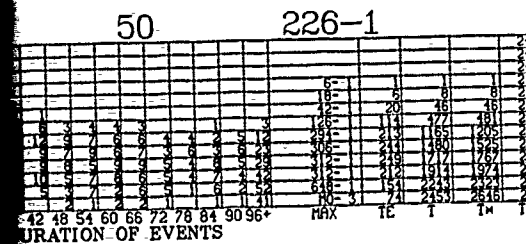
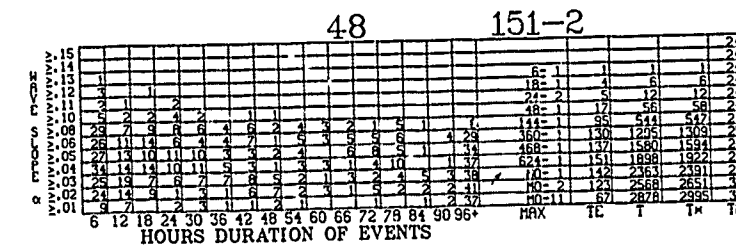
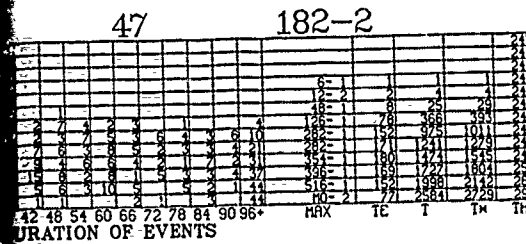
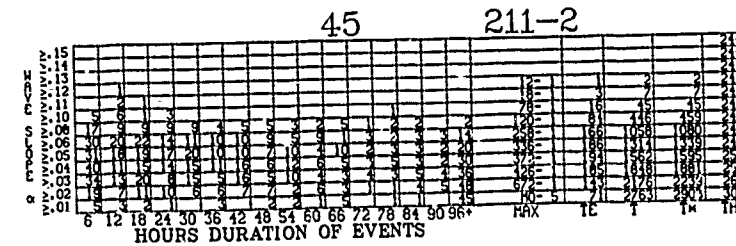
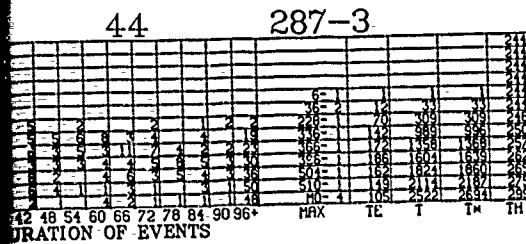
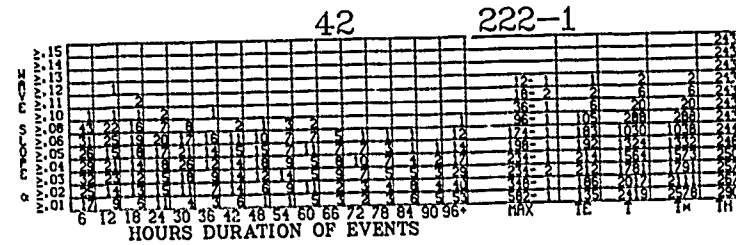
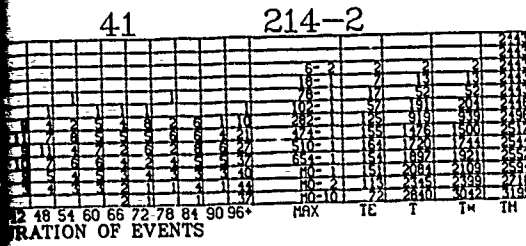
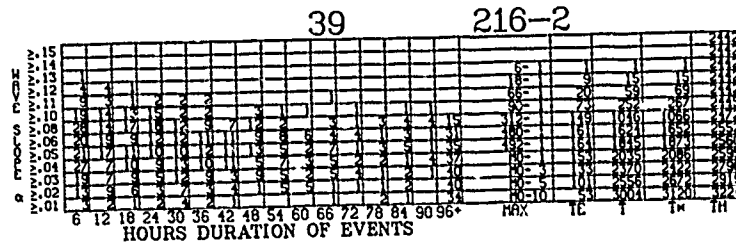
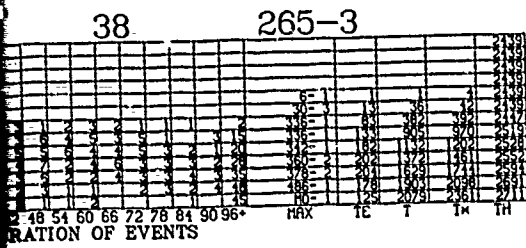
52 262-1



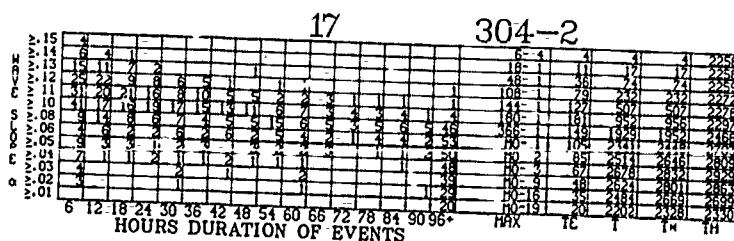
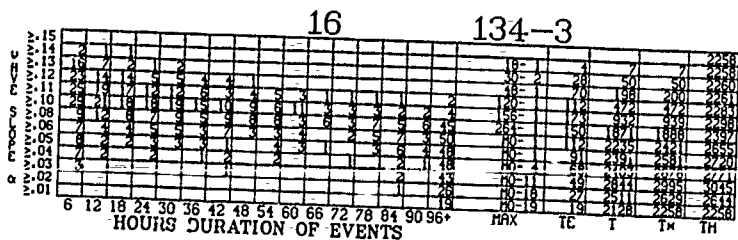
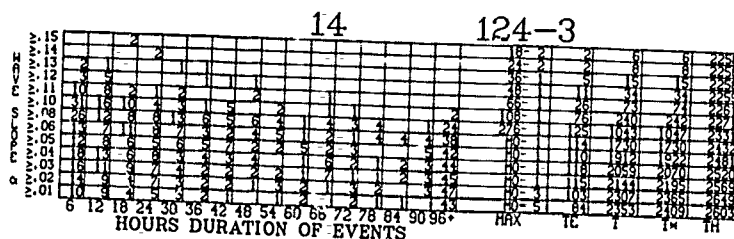
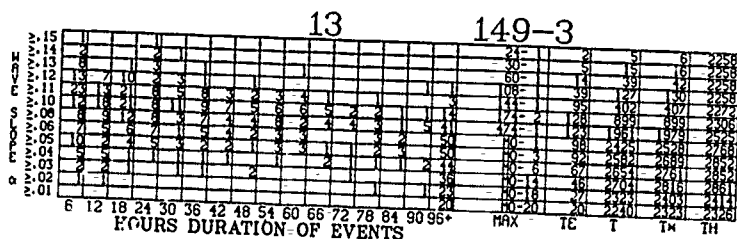
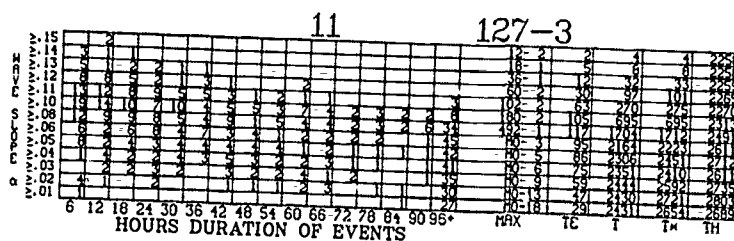
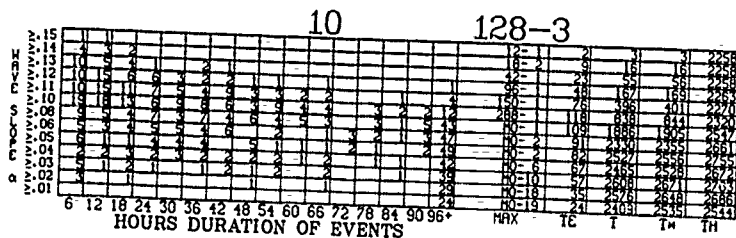
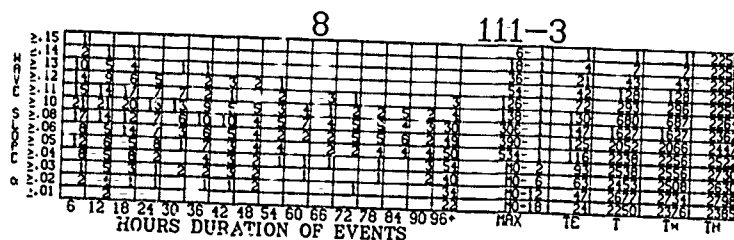
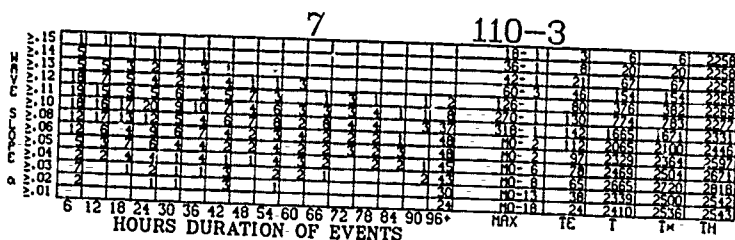
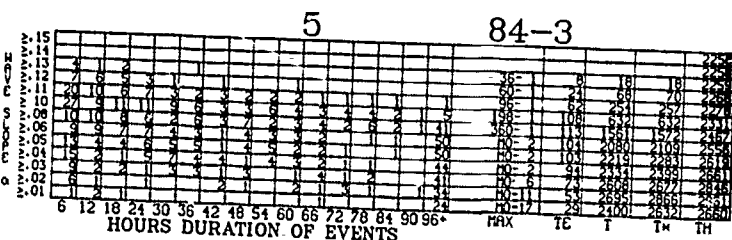
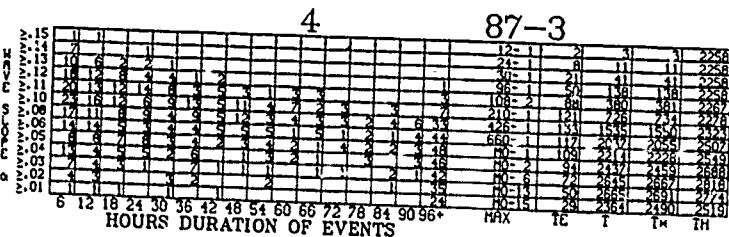
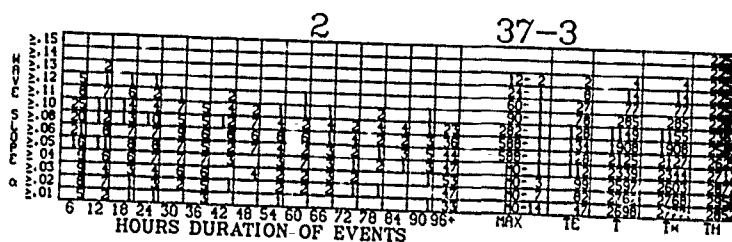
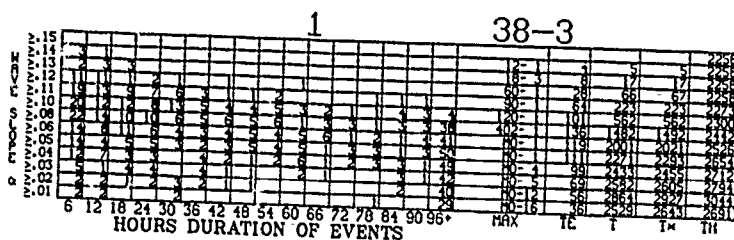
53 127-2



# JANUARY

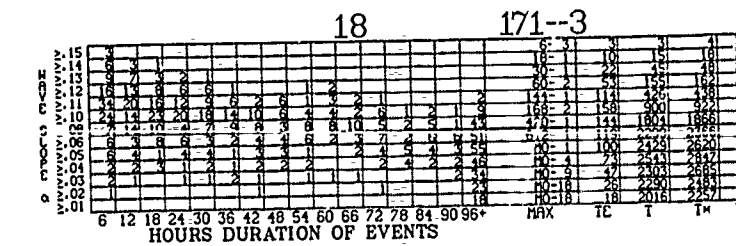
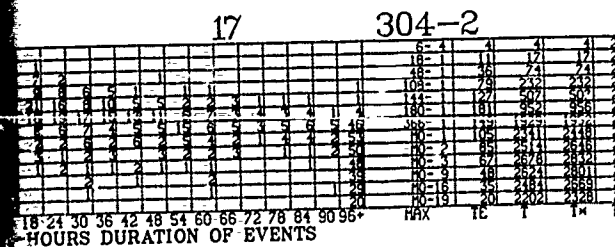
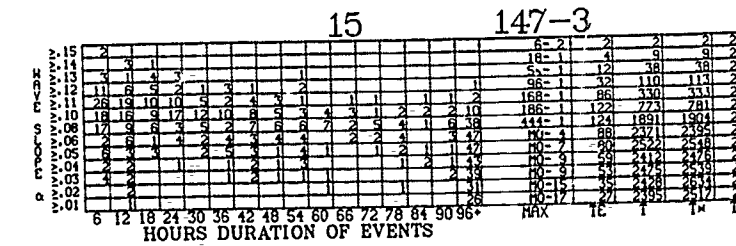
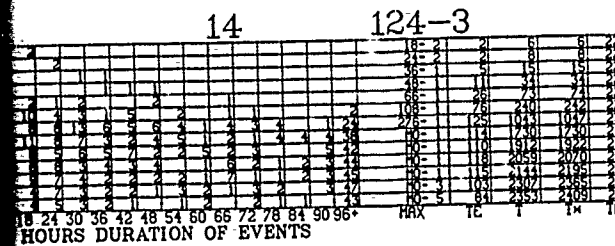
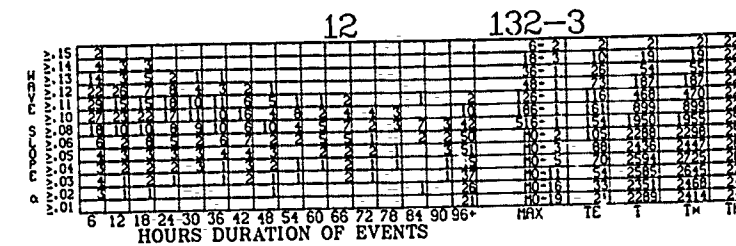
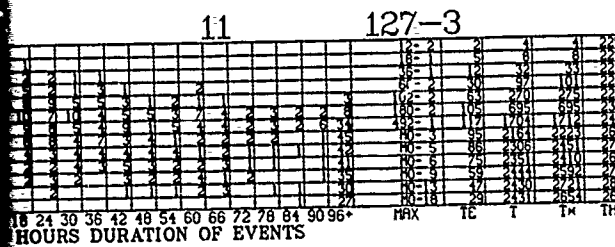
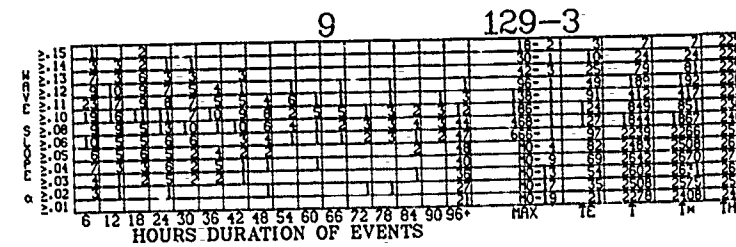
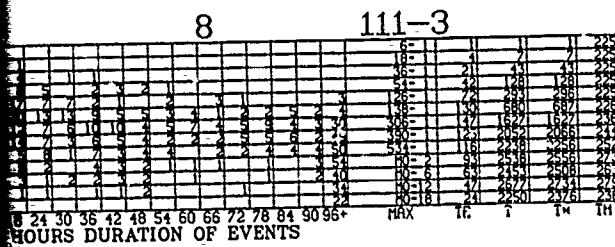
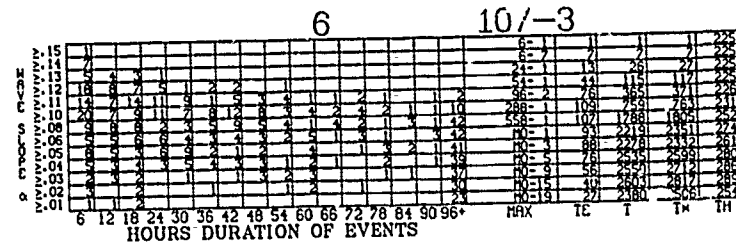
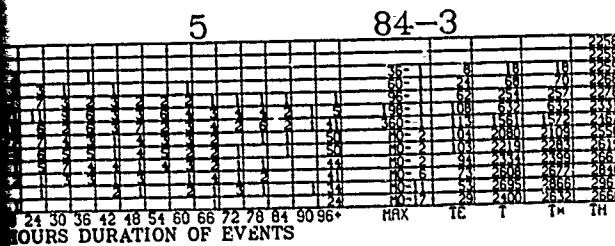
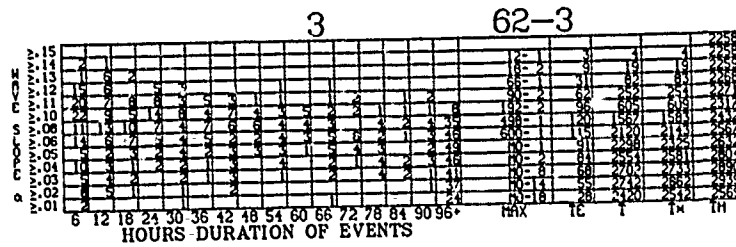
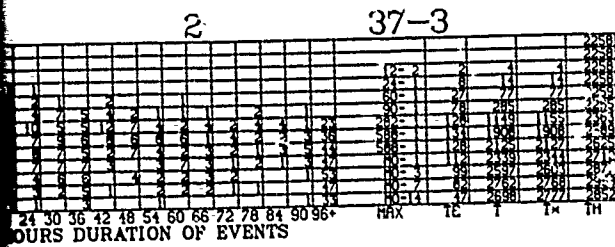


# FEBRUARY



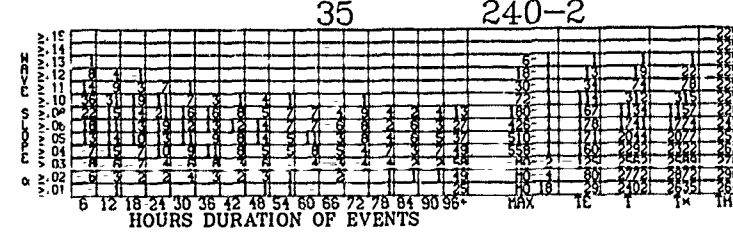
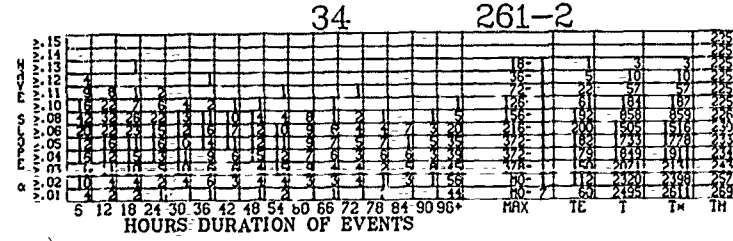
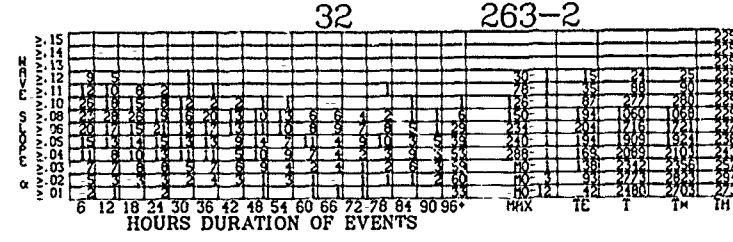
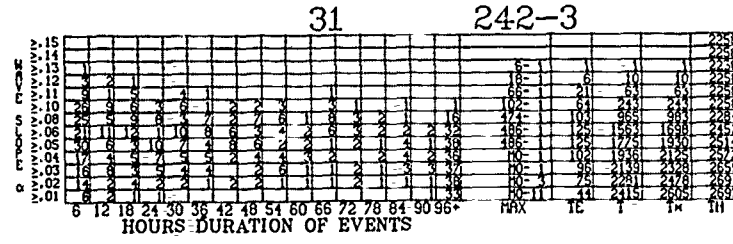
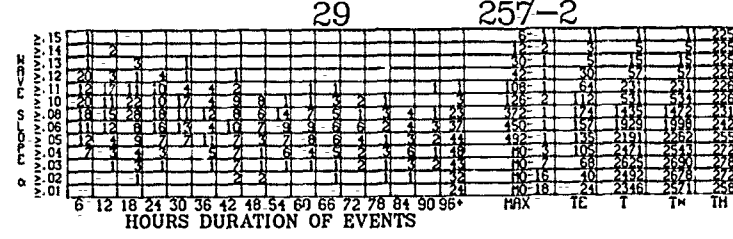
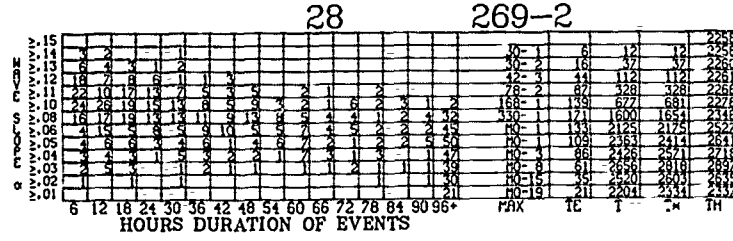
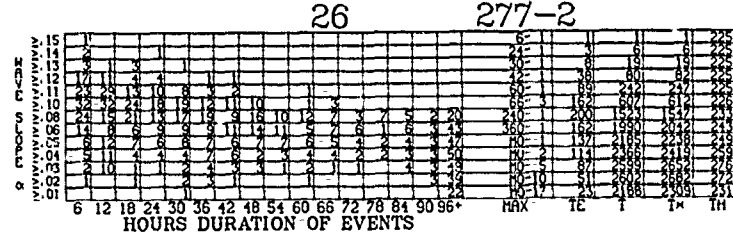
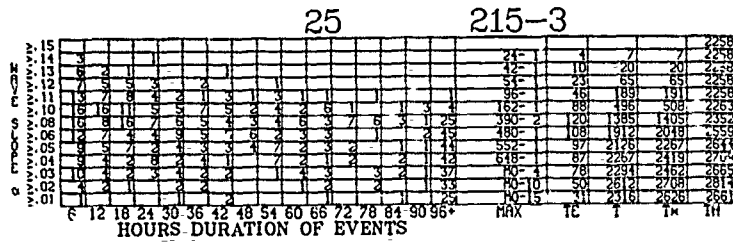
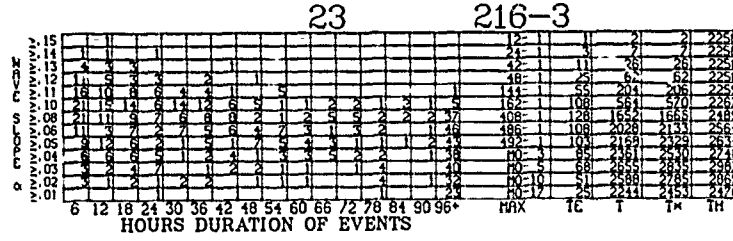
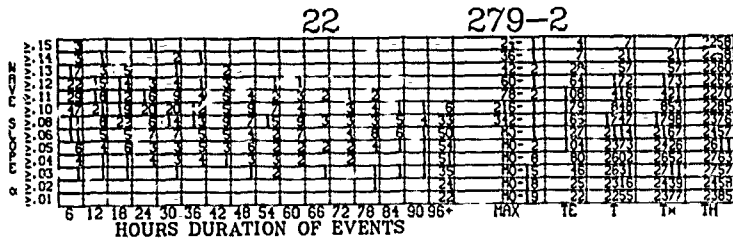
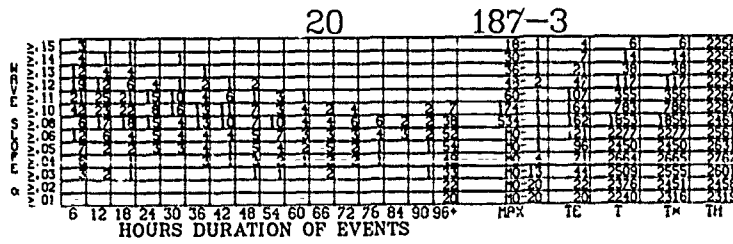
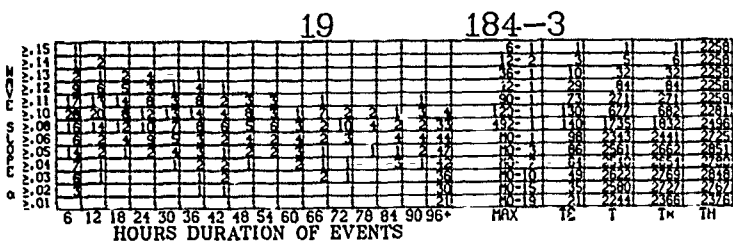


# WAVE SLOPE ( $\alpha$ ) DURATIONS





# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



FEBRUARY

20 187-3

[illegible]

21                      182-3

HOURS DURATION OF EVENTS	P PROBABILITY
6	0.01
12	0.02
18	0.03
24	0.04
30	0.05
36	0.06
42	0.07
48	0.08
54	0.09
60	0.10
66	0.11
72	0.12
78	0.13
84	0.14
90	0.15
96+	0.16

23                      216-3

[illegible]

24 218-3

HOURS DURATION OF EVENTS	NUMBER OF EVENTS
6	1
12	1
18	1
24	1
30	1
36	1
42	1
48	1
54	1
60	1
66	1
72	1
78	1
84	1
90	1
96+	1

26                      277-2

[illegible]

27 214-3

[illegible]

29 257-2

[illegible]

30 247-2

[illegible]

32 263-2

DURATION OF EVENTS	Frequency
36	2
42	1
48	1
54	1
60	1
66	1
72	1
78	1
84	1
90	1
96	1
MAX	30
1E	1
1	1
1x	1
TH	1

33 243-2

[illegible]

35 240-2

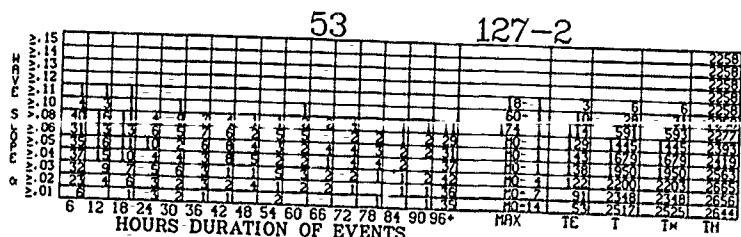
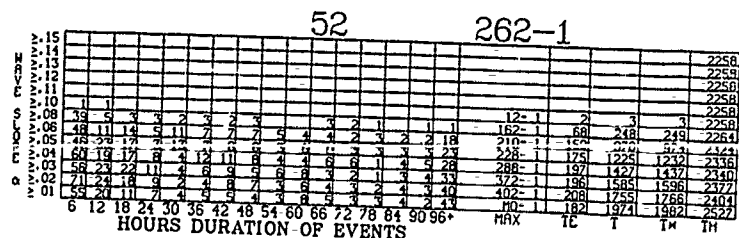
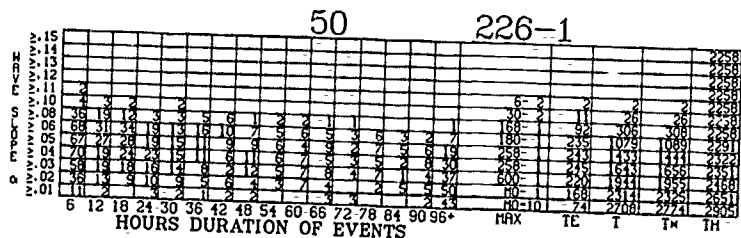
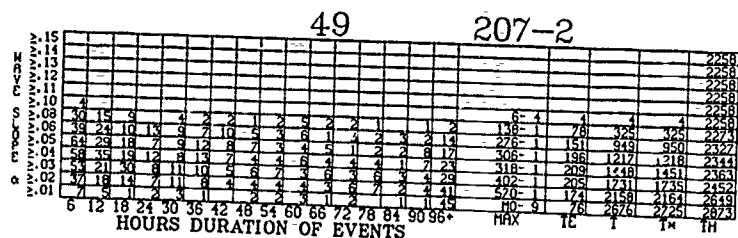
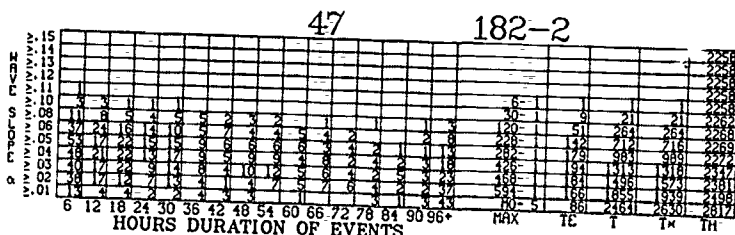
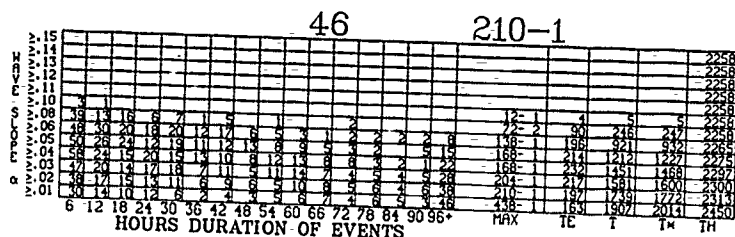
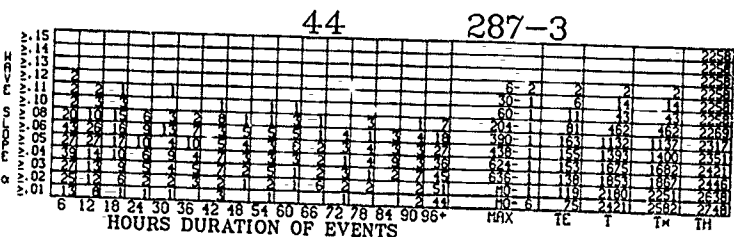
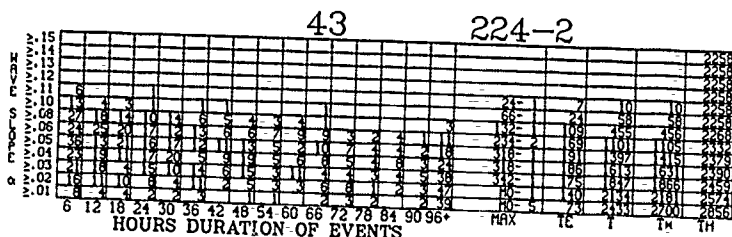
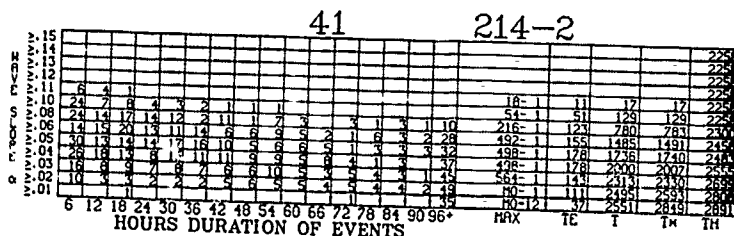
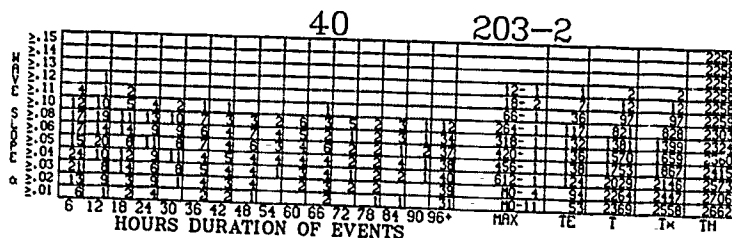
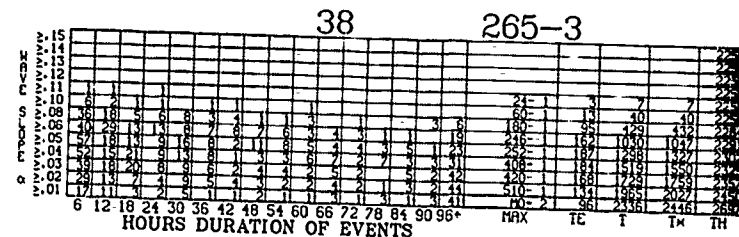
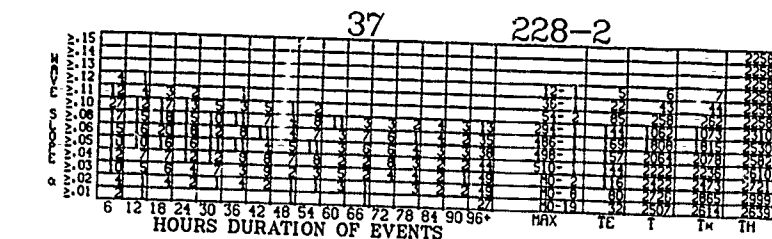
DURATION OF EVENTS	NUMBER OF EVENTS
36	18
42	15
48	12
54	10
60	8
66	6
72	4
78	3
84	2
90	1
96	1
MAX	1

36 220-2

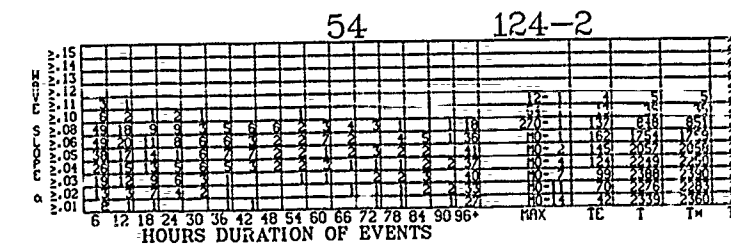
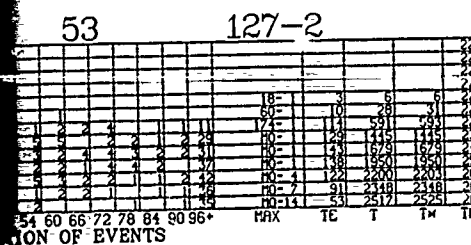
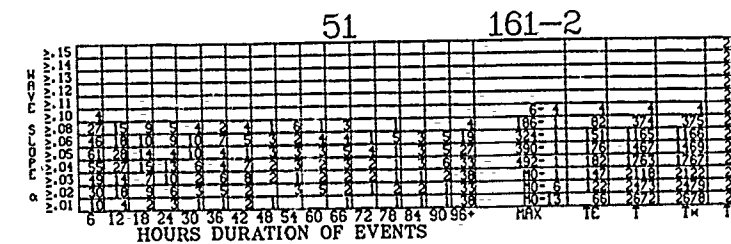
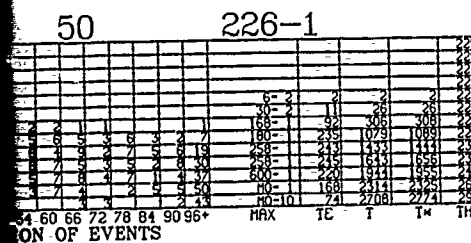
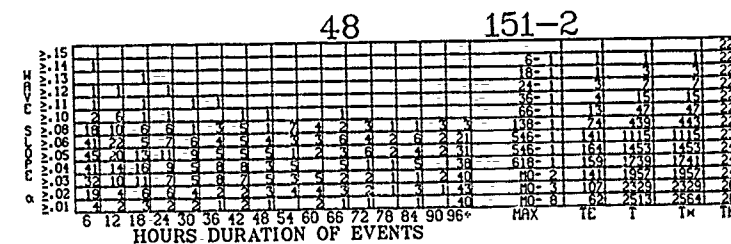
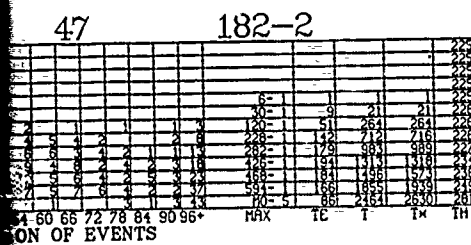
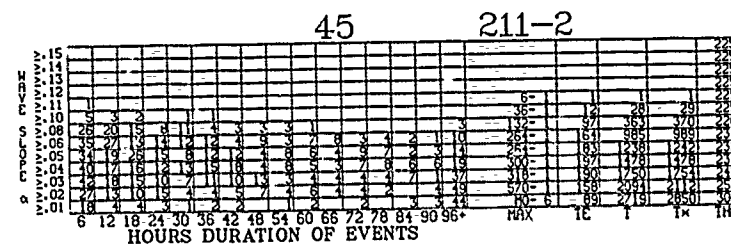
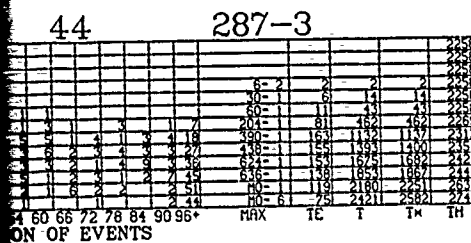
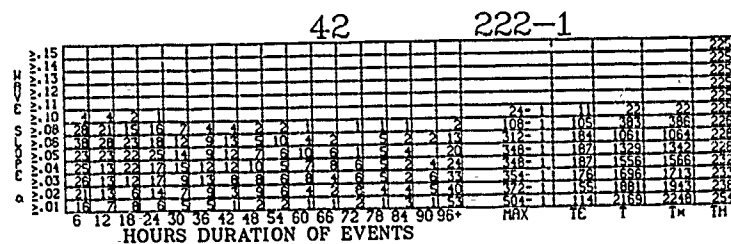
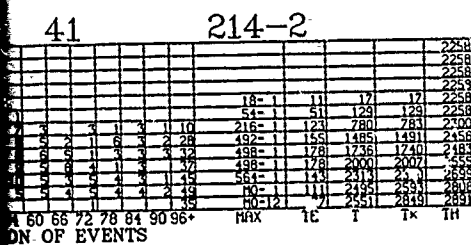
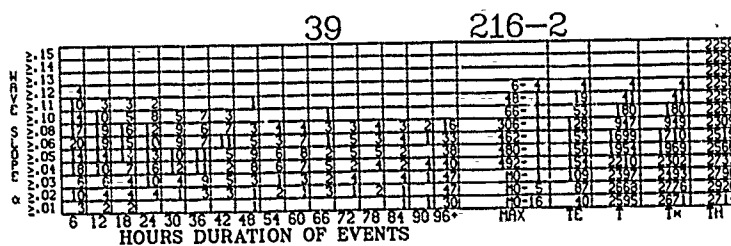
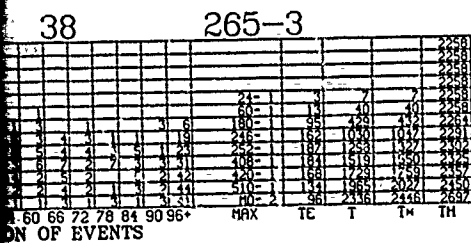
[illegible]

# FEBRUARY

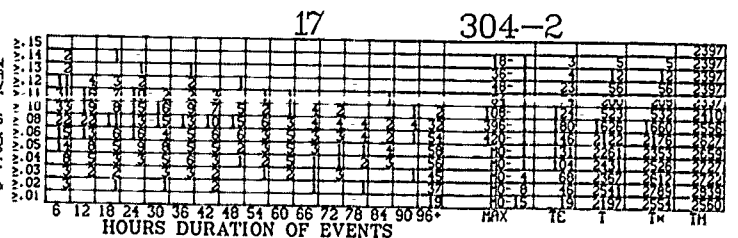
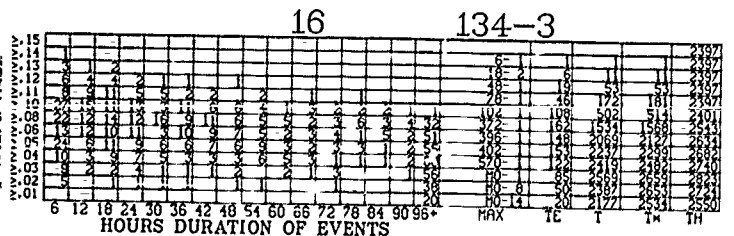
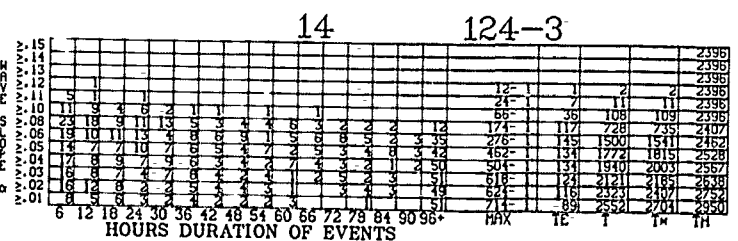
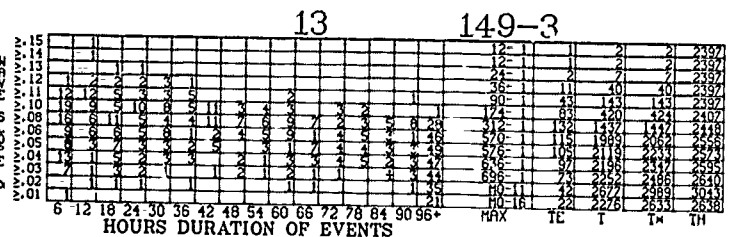
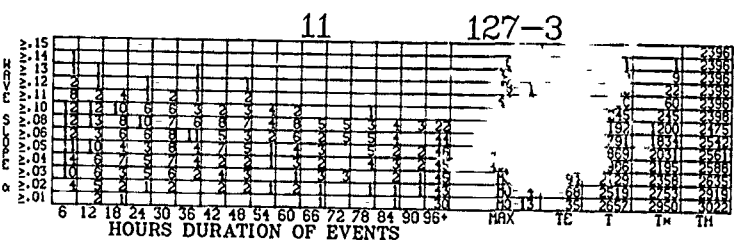
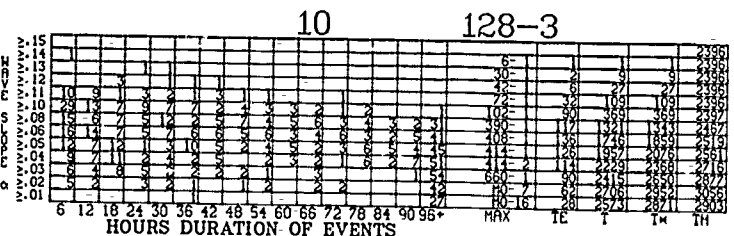
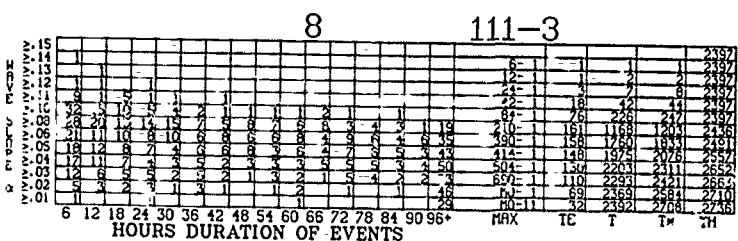
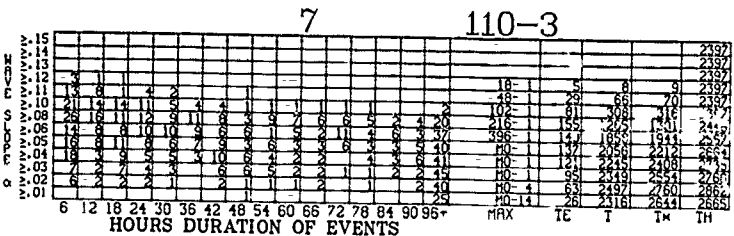
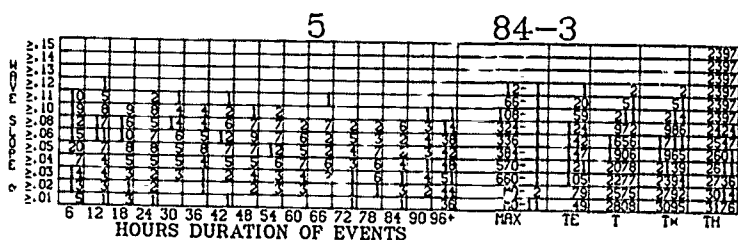
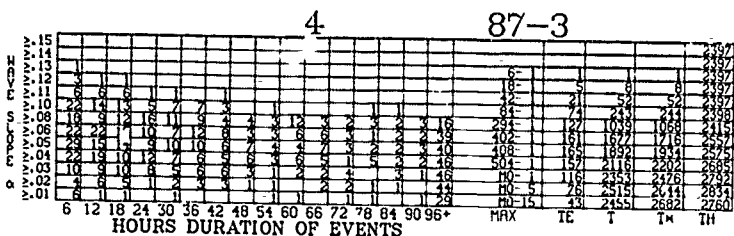
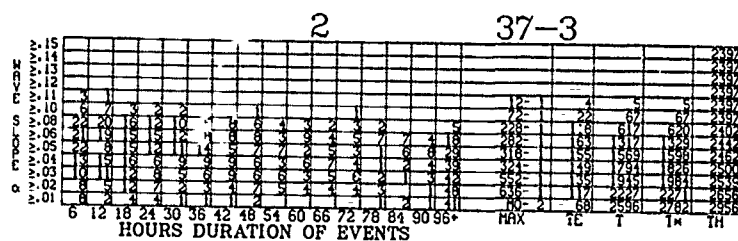
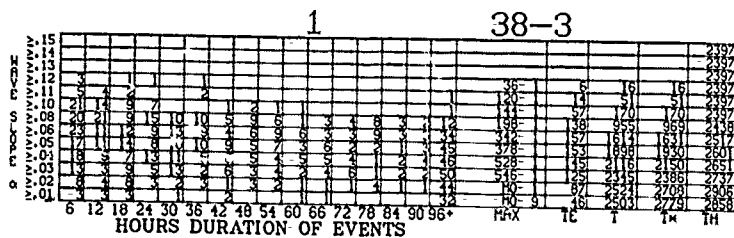
# WAVE



# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



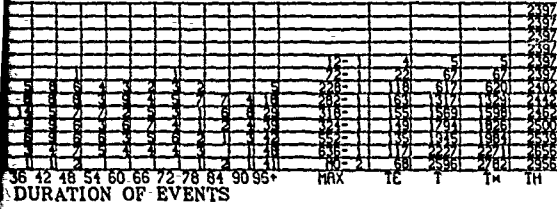
# WAVE SLOPE ( $\alpha$ ) DURATIONS



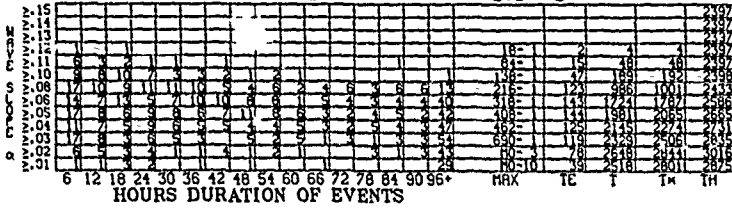


APRIL

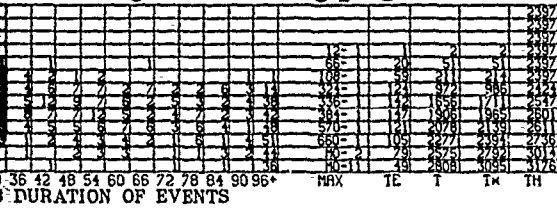
2 37-3



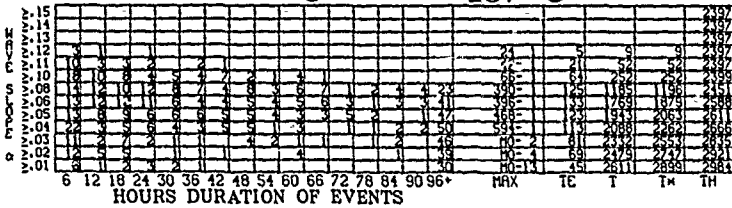
3 62-3



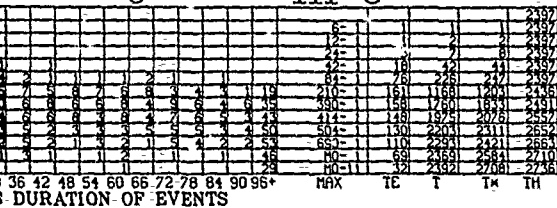
5 84-3



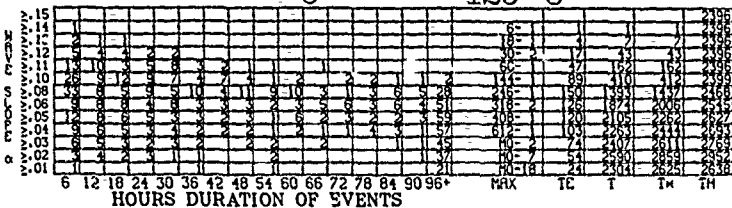
6 107-3



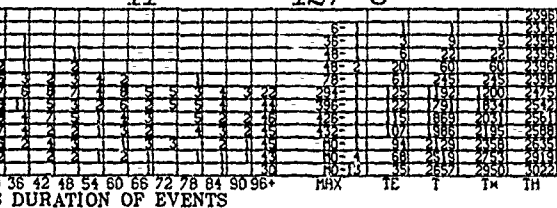
8 111-3



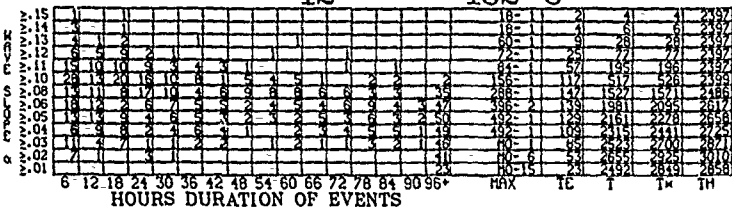
9 129-3



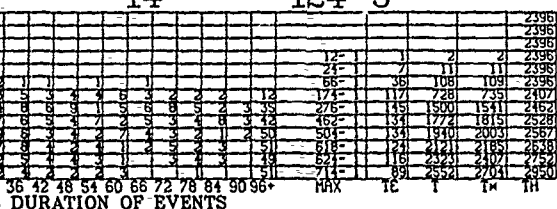
11 127-3



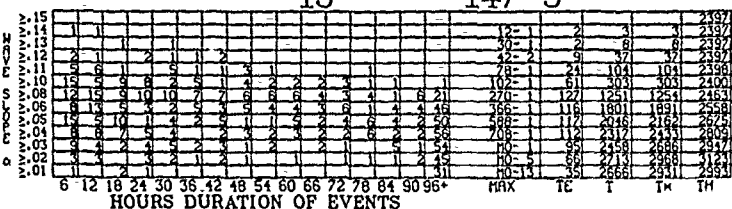
12 132-3



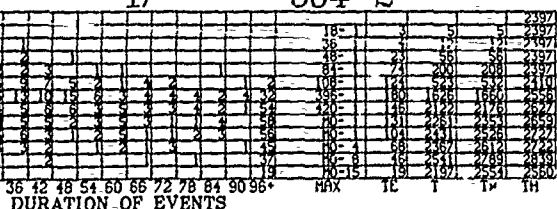
14 124-3



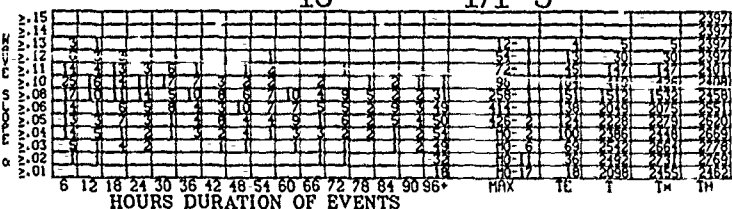
15 147-3



17 304-2



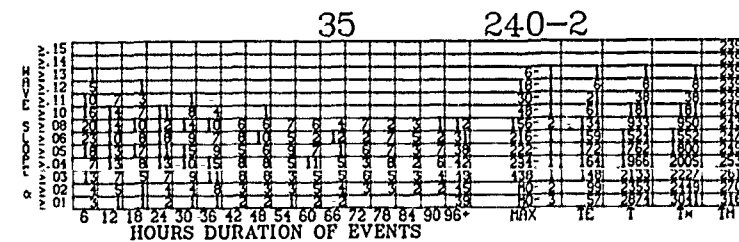
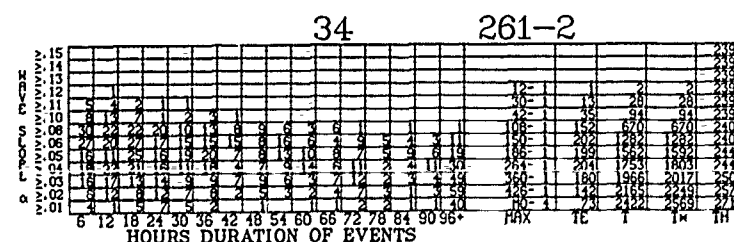
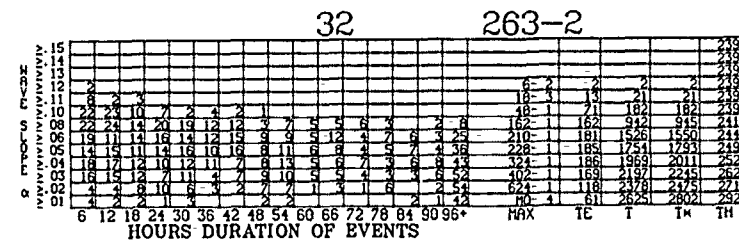
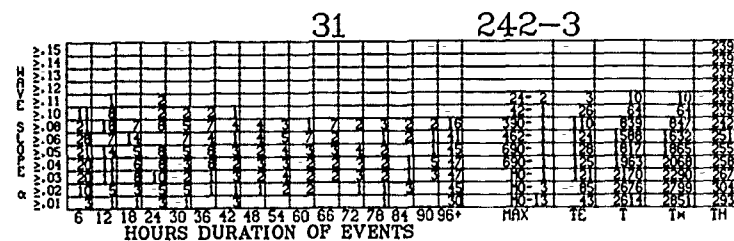
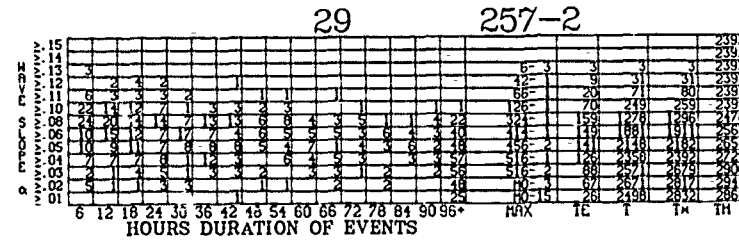
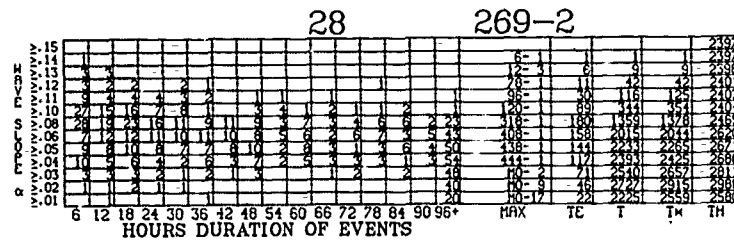
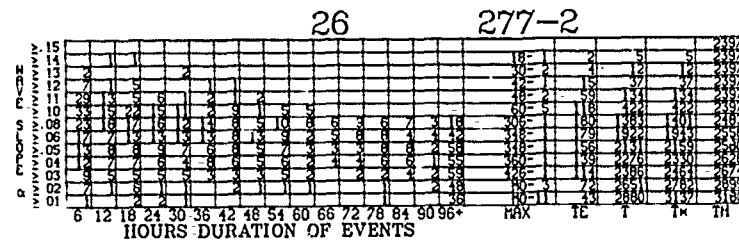
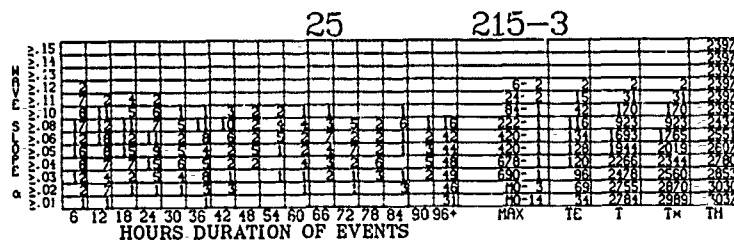
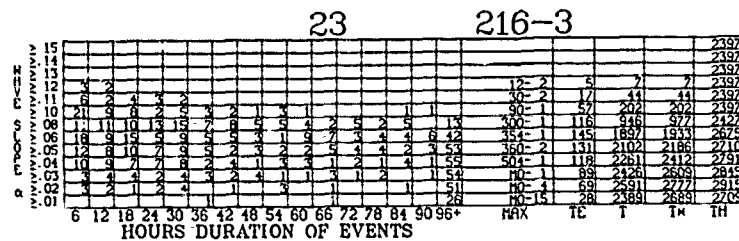
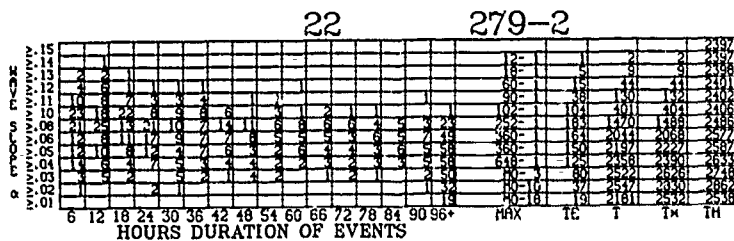
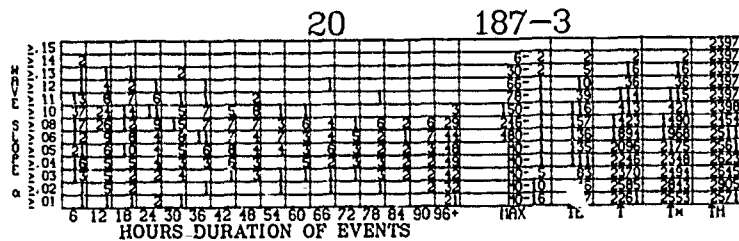
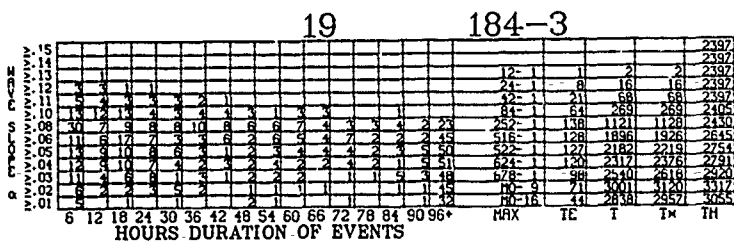
18 171-3



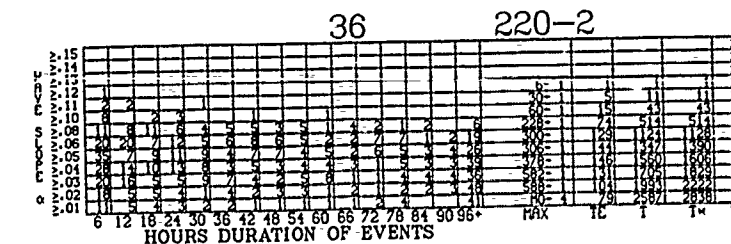
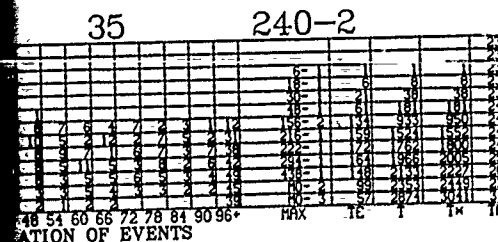
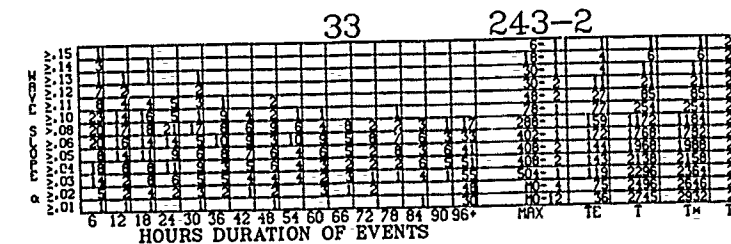
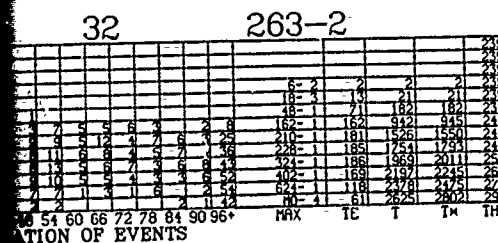
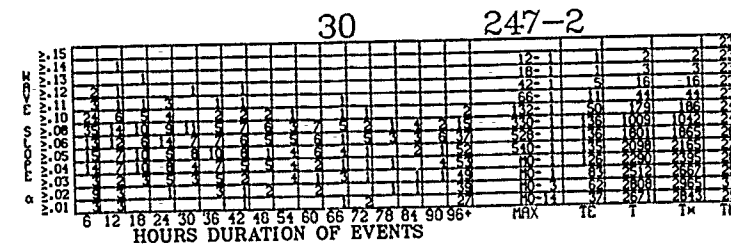
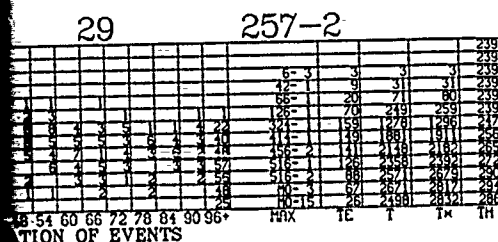
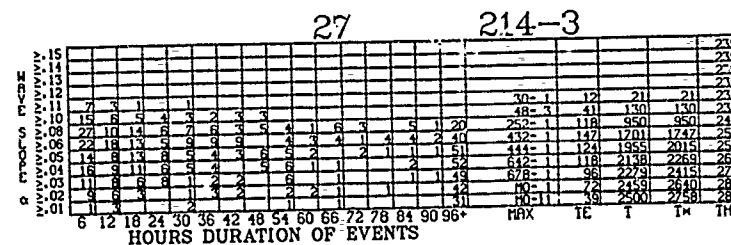
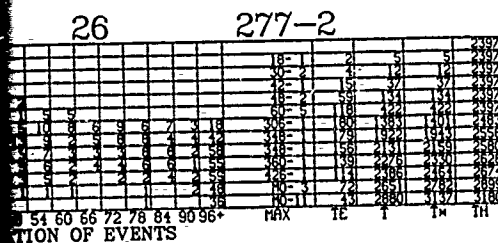
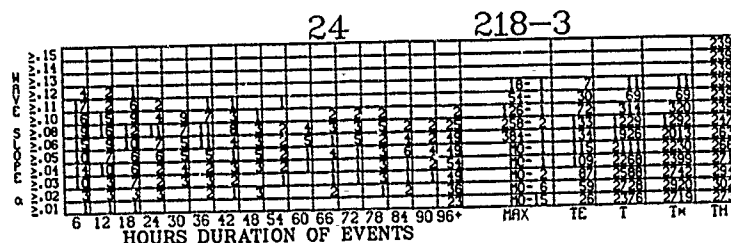
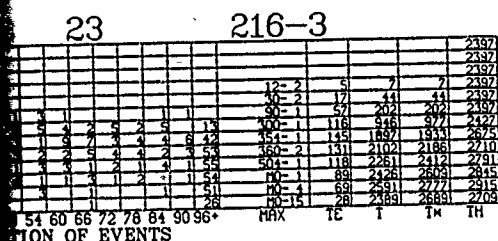
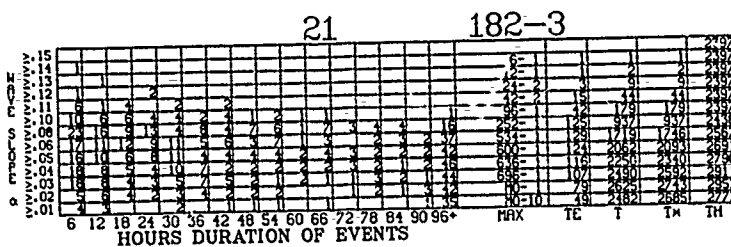
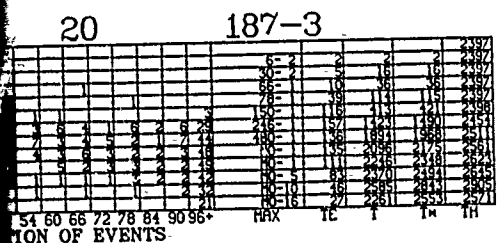


APRIL

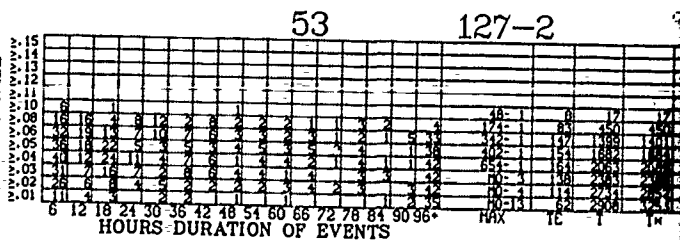
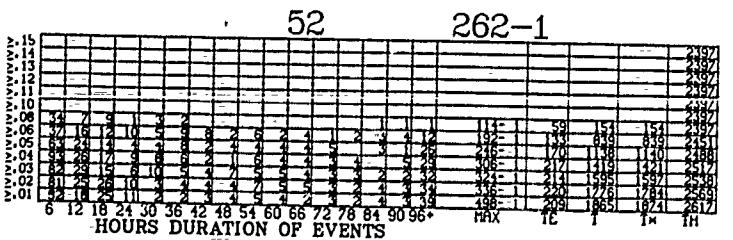
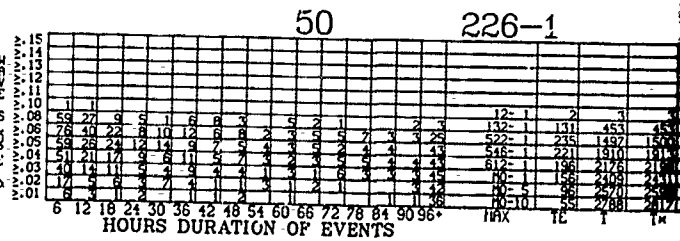
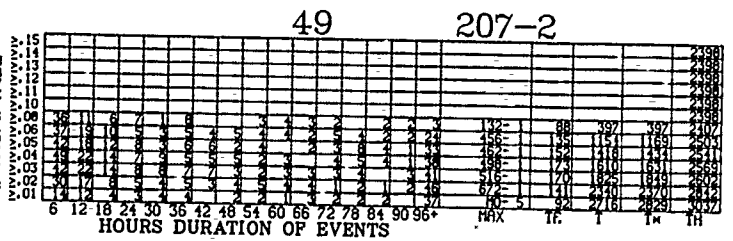
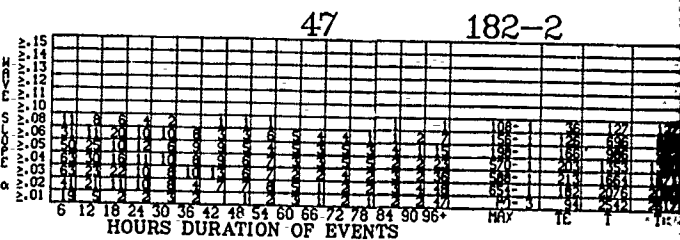
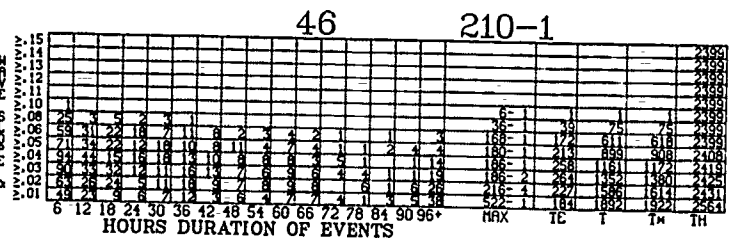
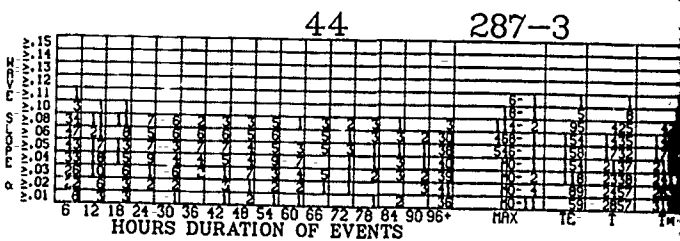
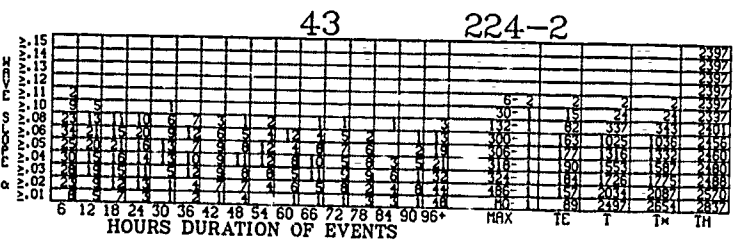
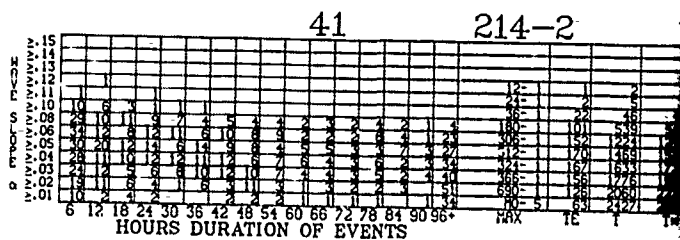
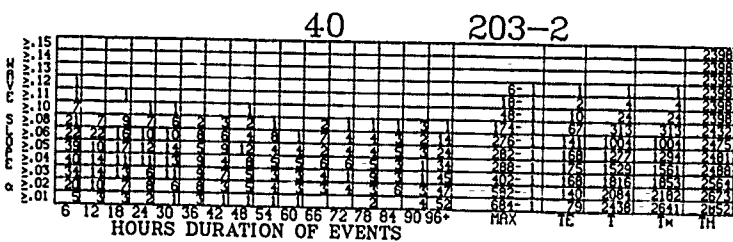
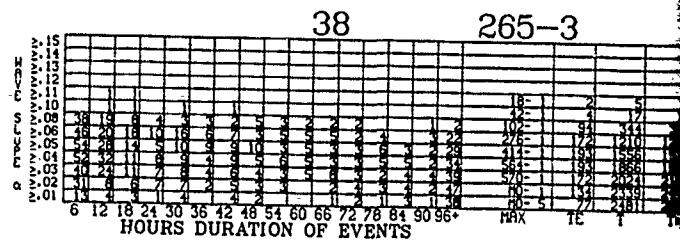
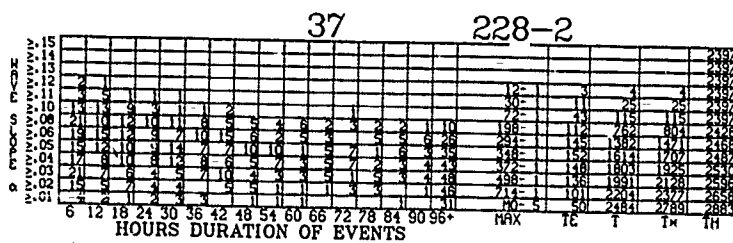
WAVE SL



# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



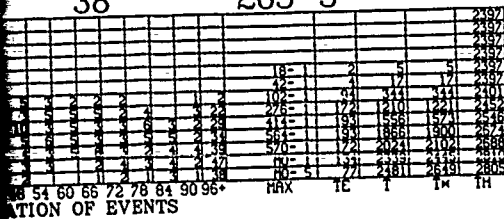
### WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



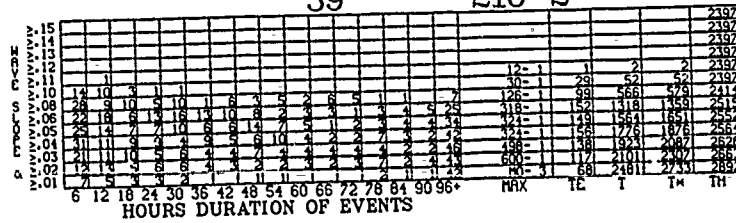
①

# APRIL

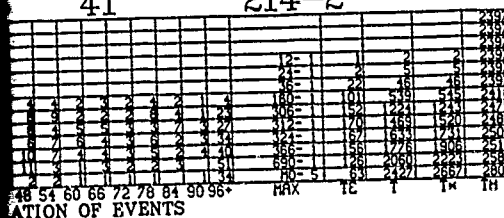
38 265-3



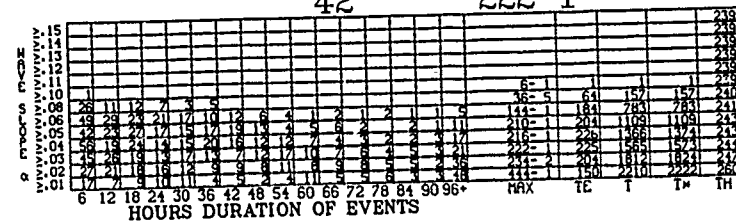
39 216-2



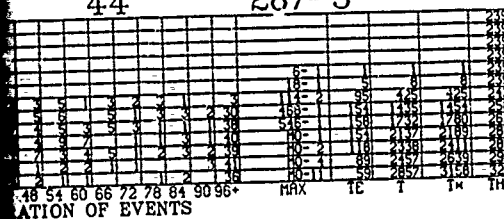
41 214-2



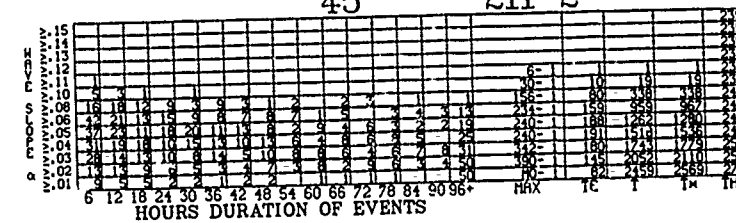
42 222-1



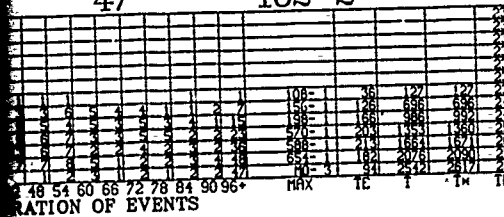
44 287-3



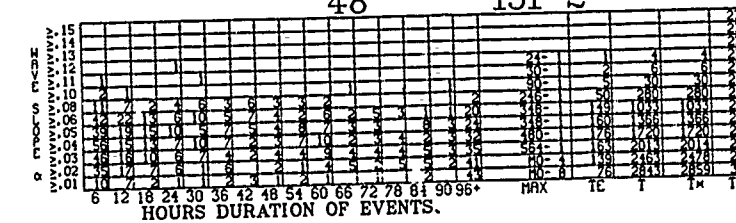
45 211-2



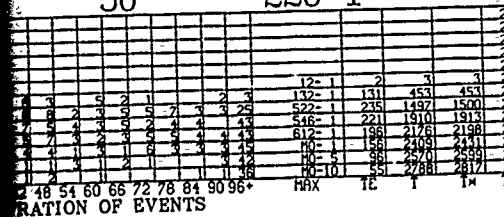
47 182-2



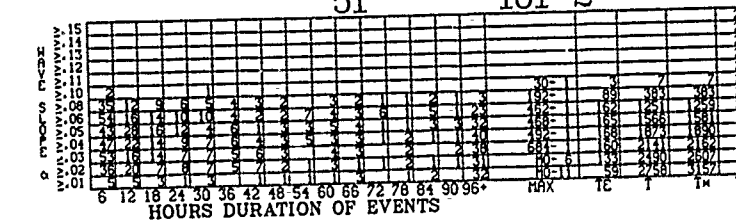
48 151-2



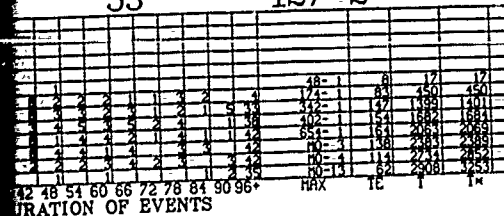
50 226-1



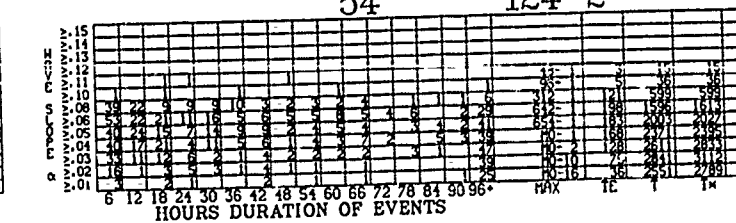
51 161-2



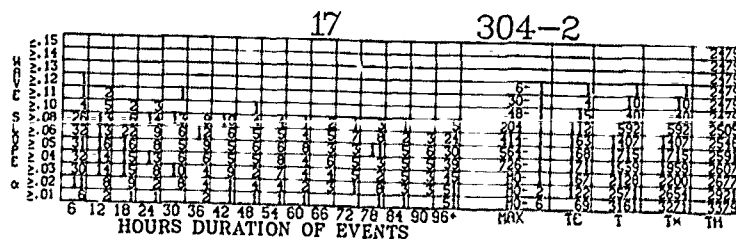
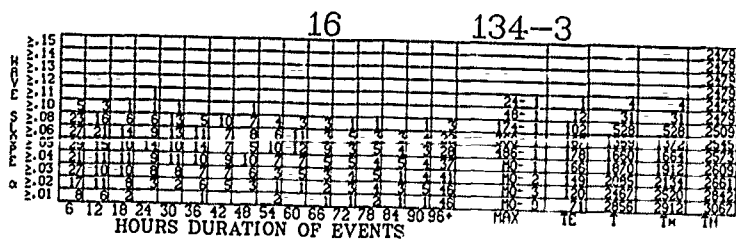
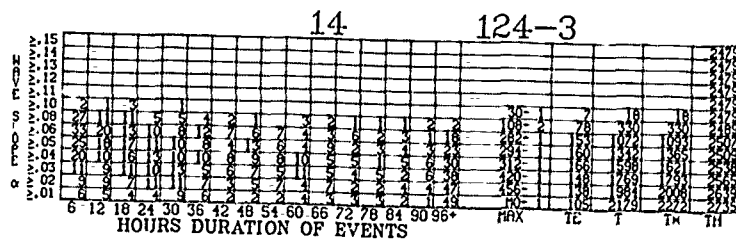
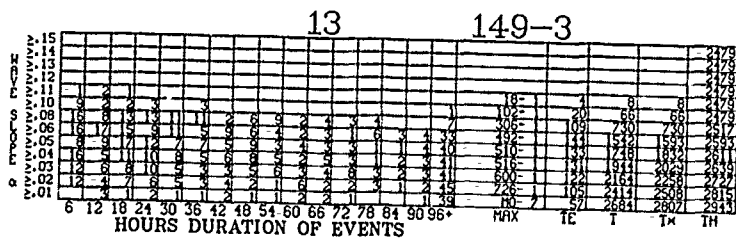
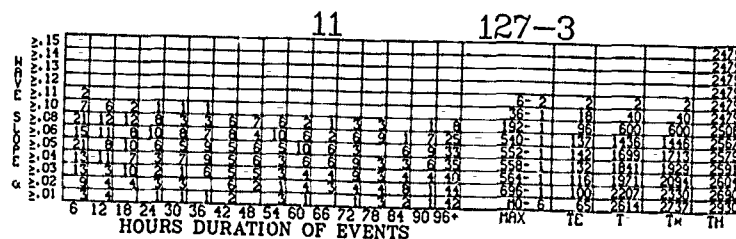
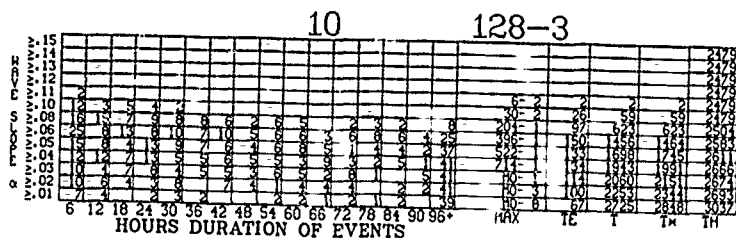
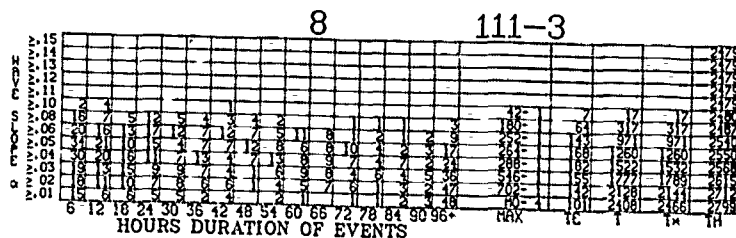
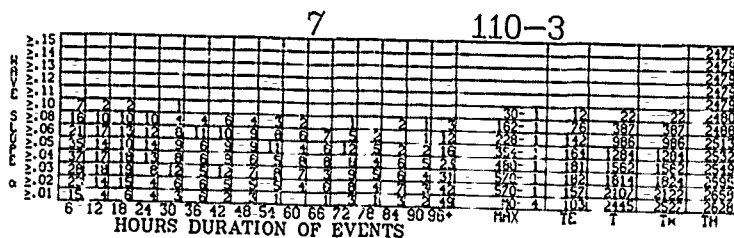
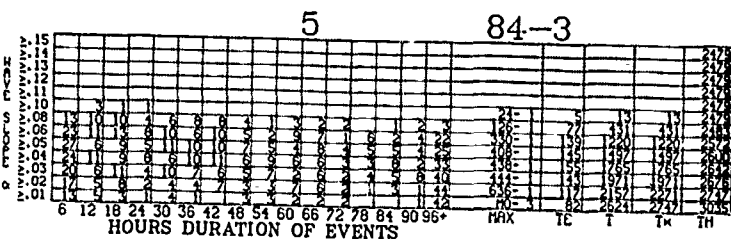
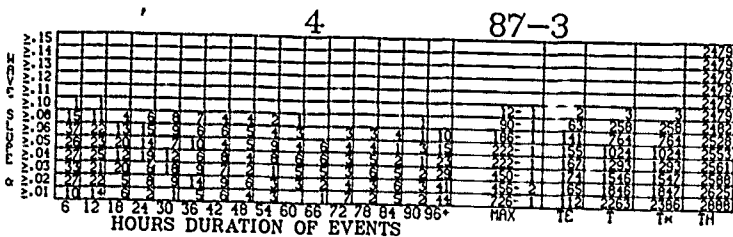
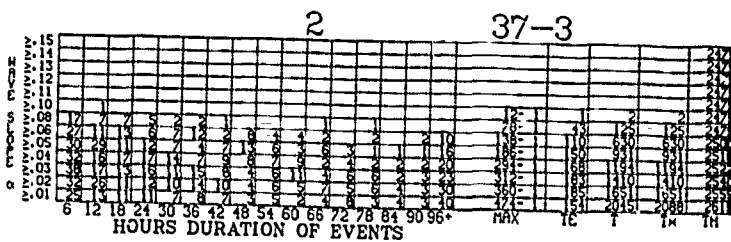
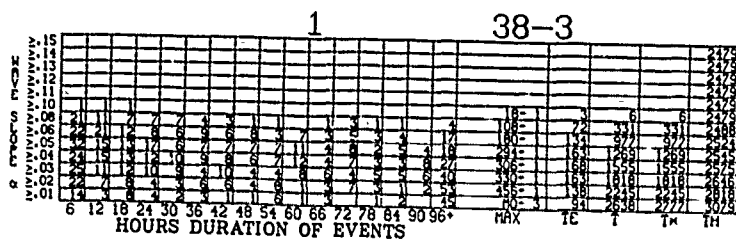
53 127-2



54 124-2

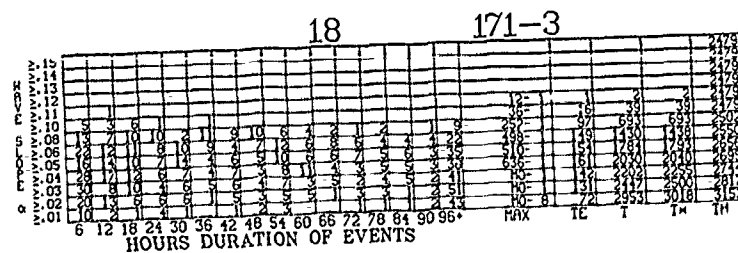
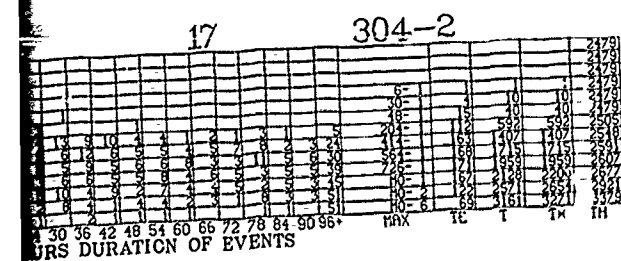
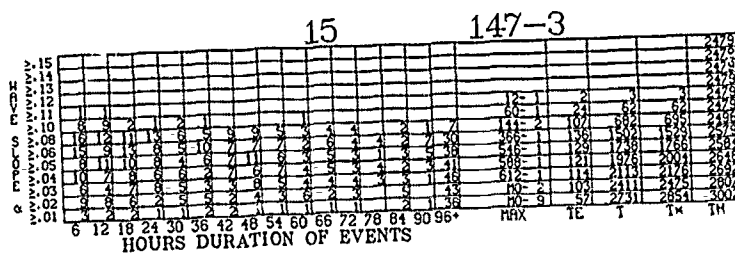
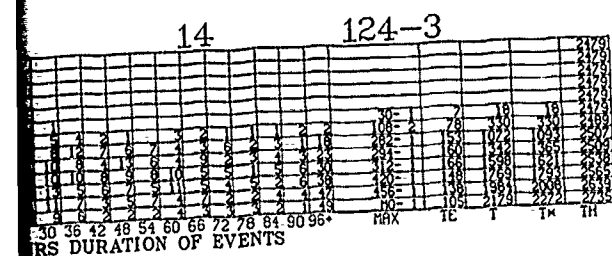
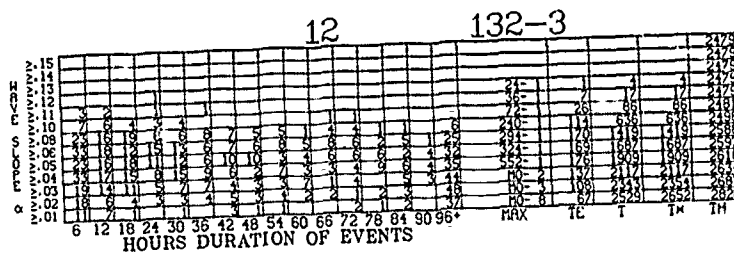
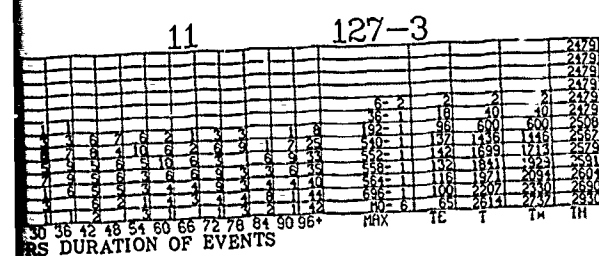
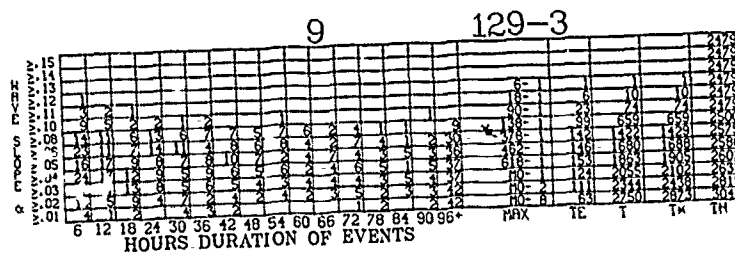
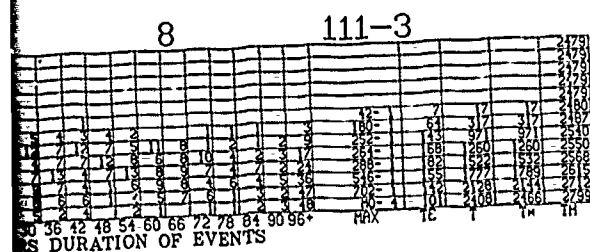
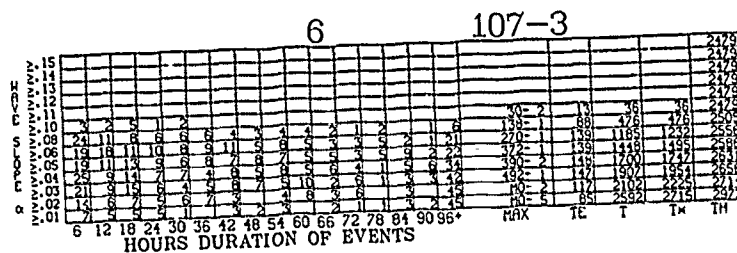
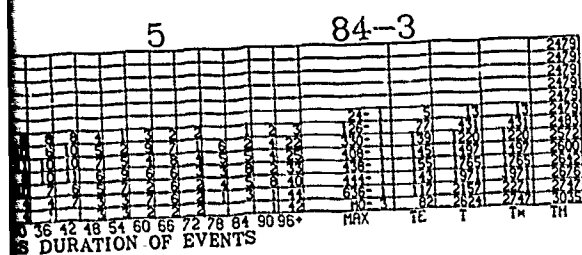
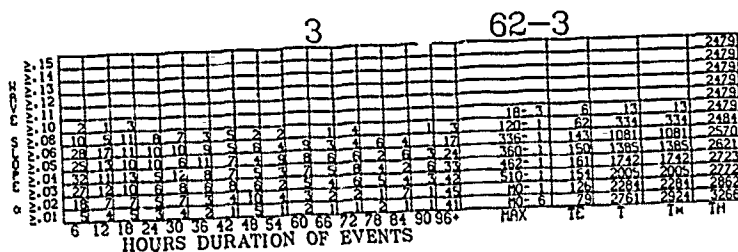
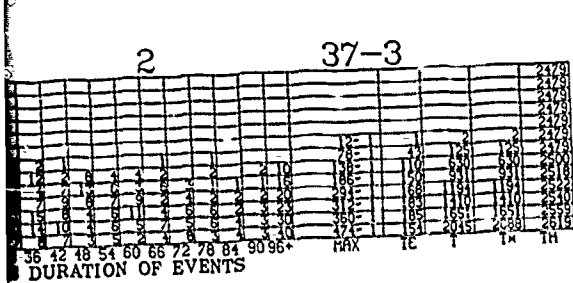


# JULY



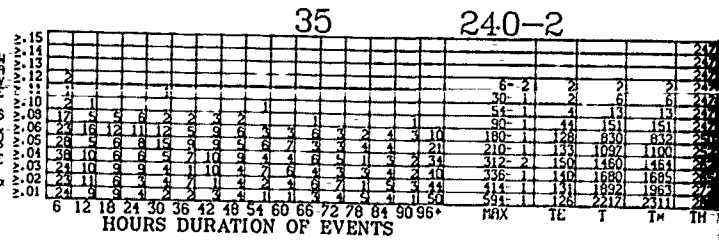
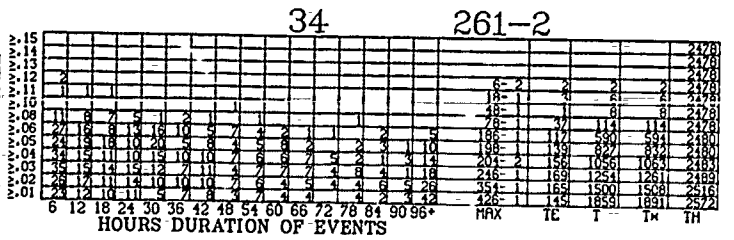
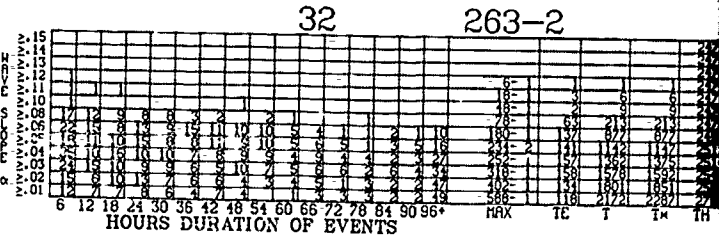
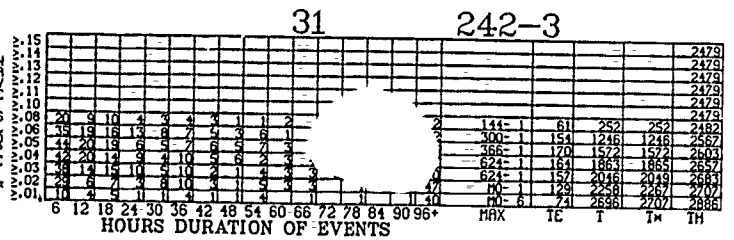
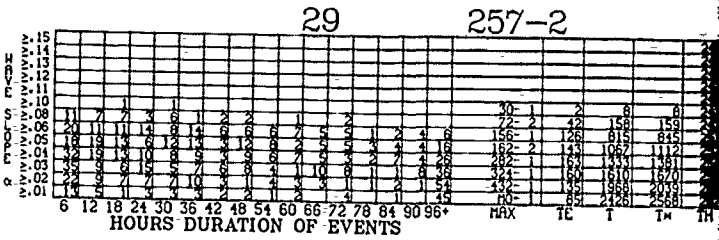
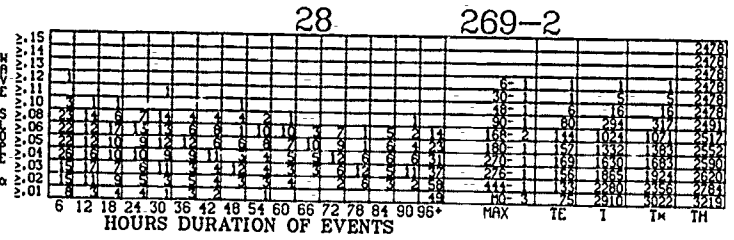
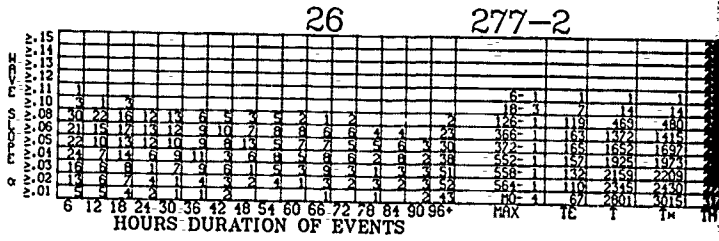
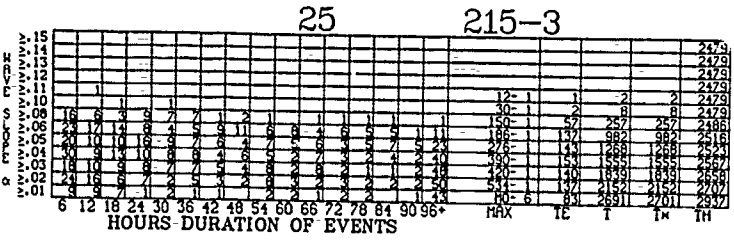
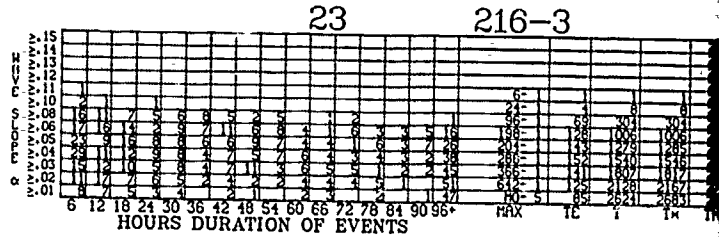
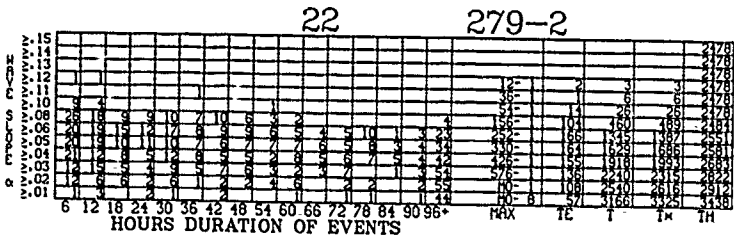
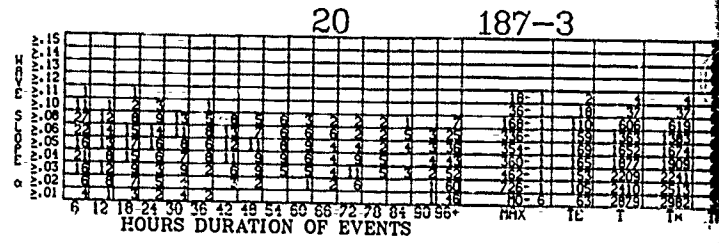
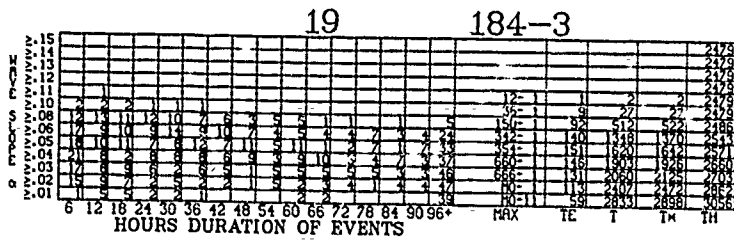


# WAVE SLOPE ( $\alpha$ ) DURATIONS





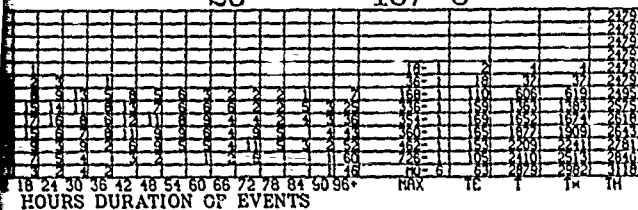
## WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



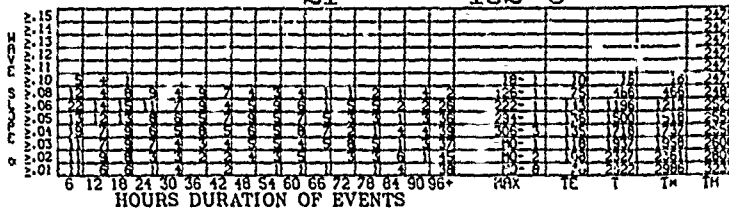
d)

JULY

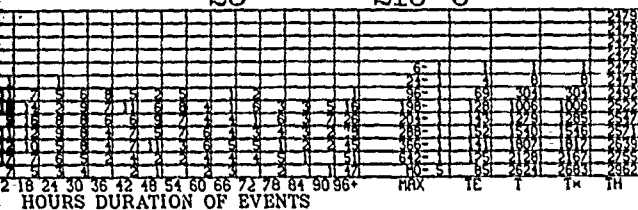
20 187-3



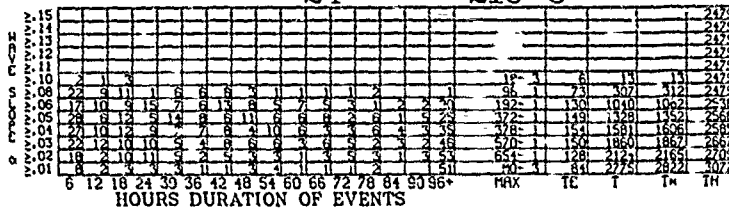
21 182-3



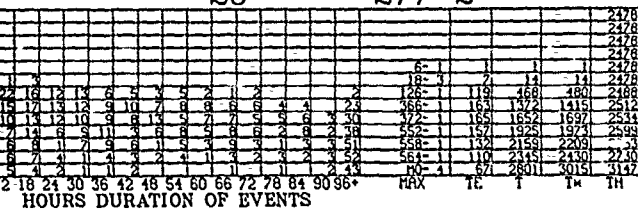
23 216-3



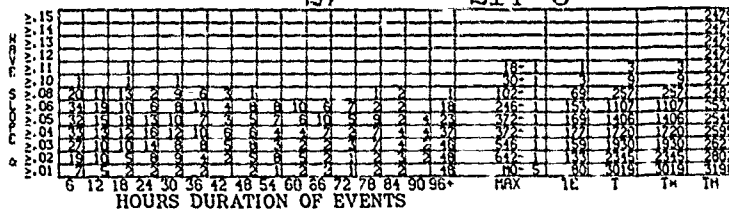
24 218-3



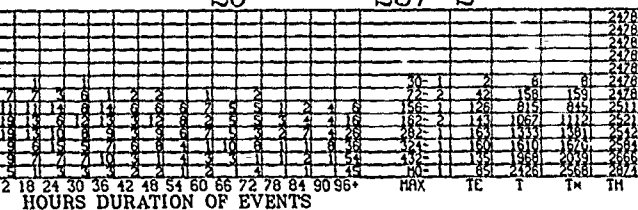
26 277-2



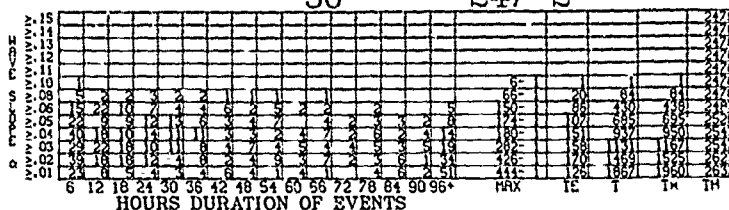
27 214-3



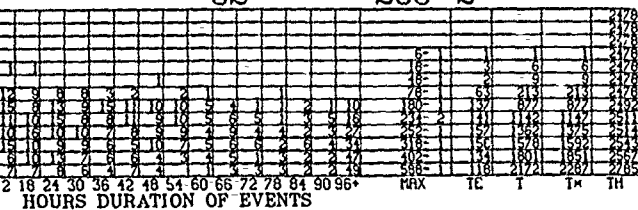
29 257-2



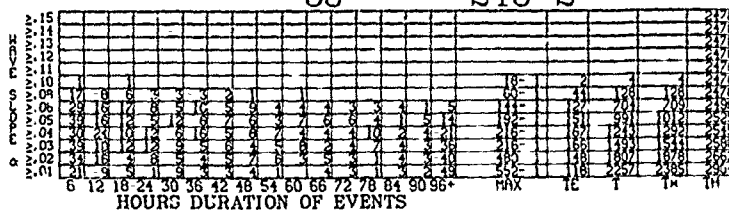
30 247-2



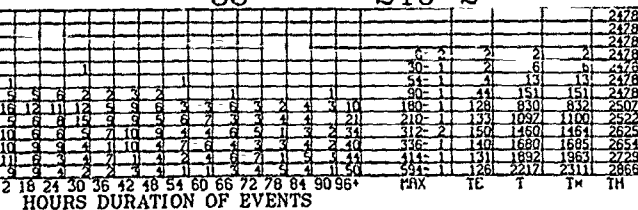
32 263-2



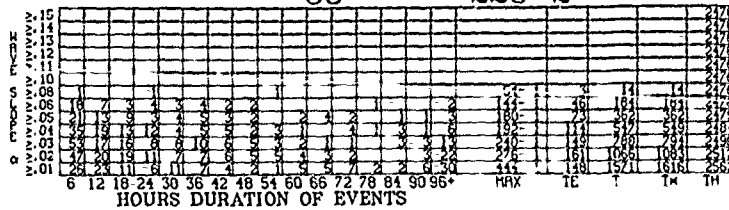
33 243-2



35 240-2



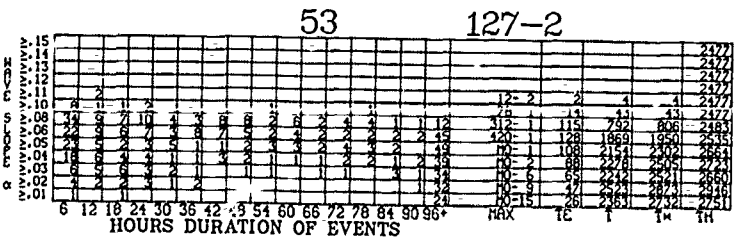
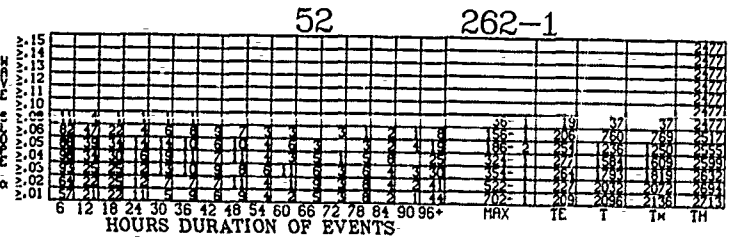
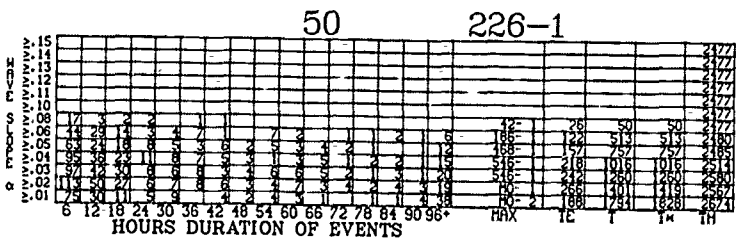
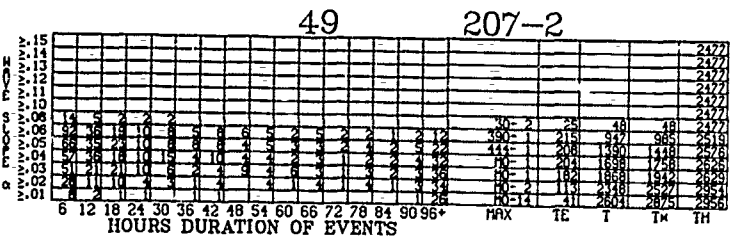
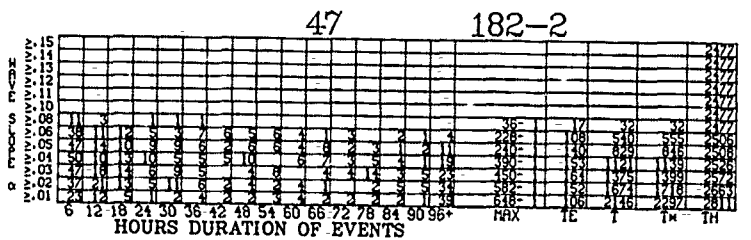
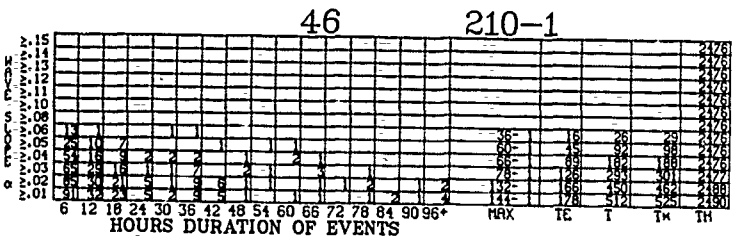
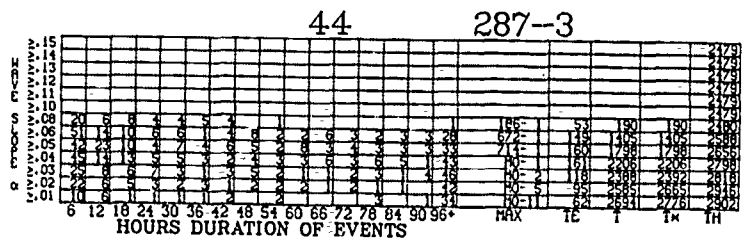
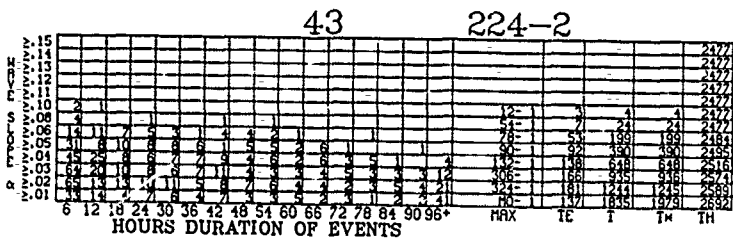
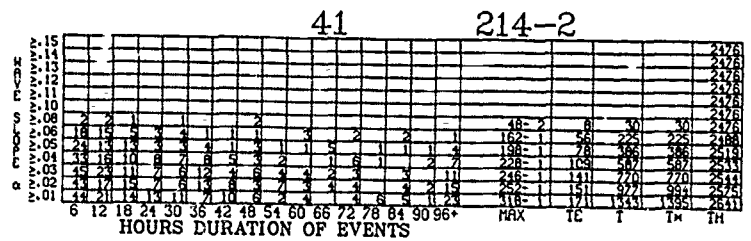
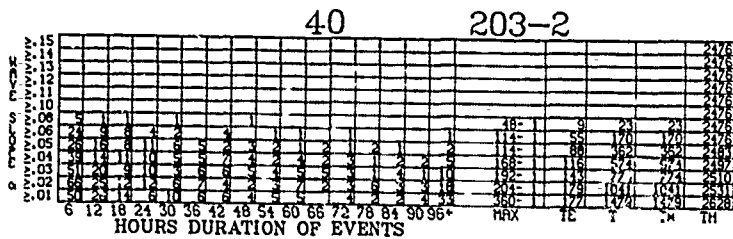
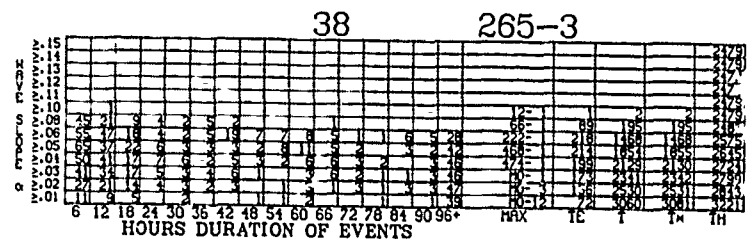
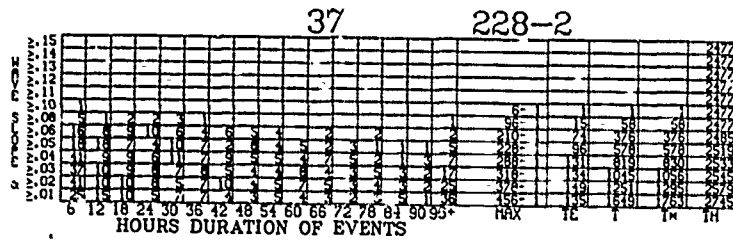
36 220-2



(2)

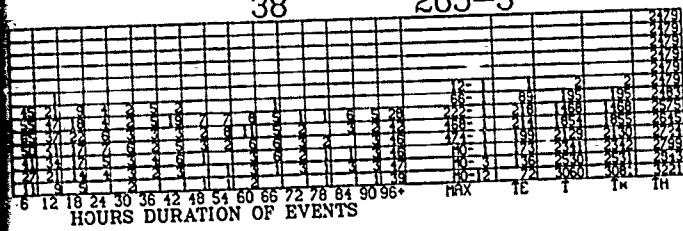
JULY

WAVE S

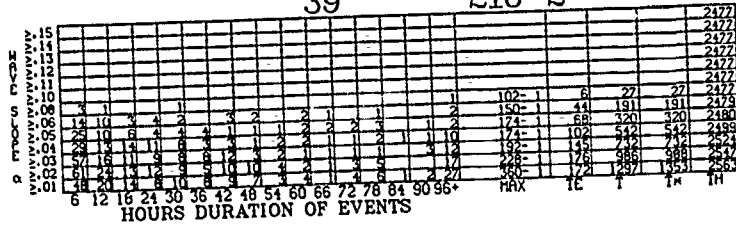


# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)

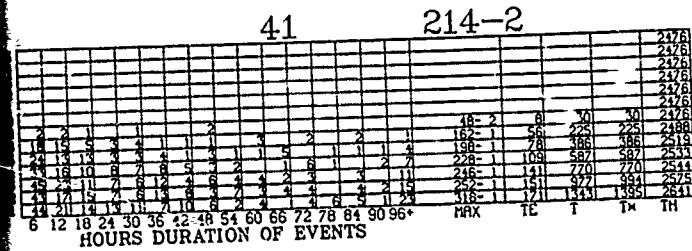
38 265-3



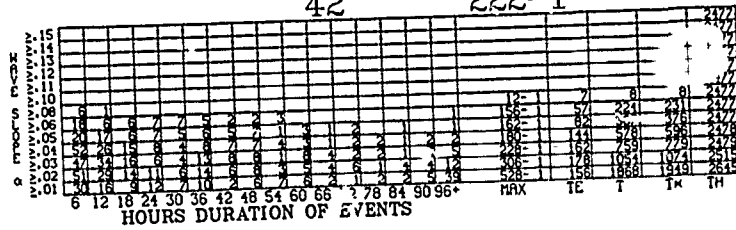
39 216-2



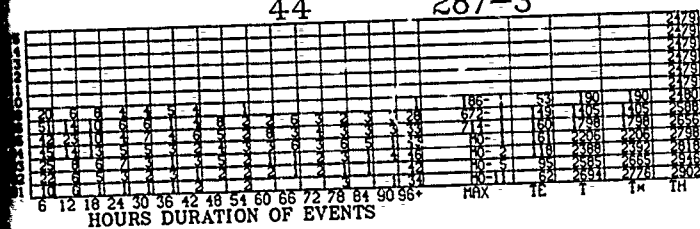
41 214-2



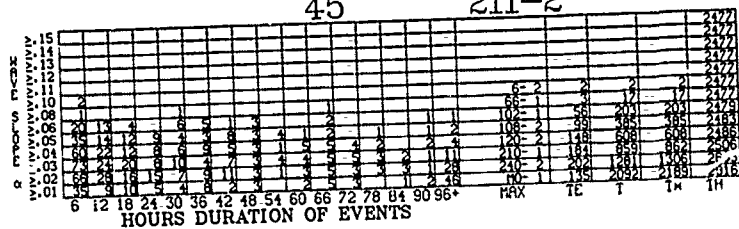
42 222-1



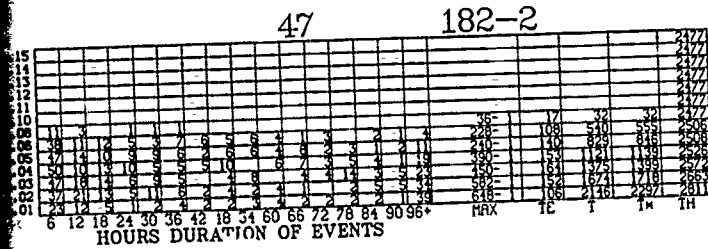
44 287-3



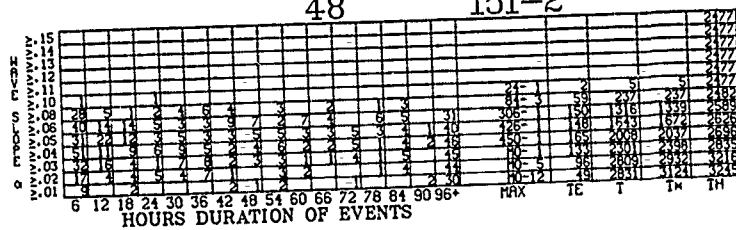
45 211-2



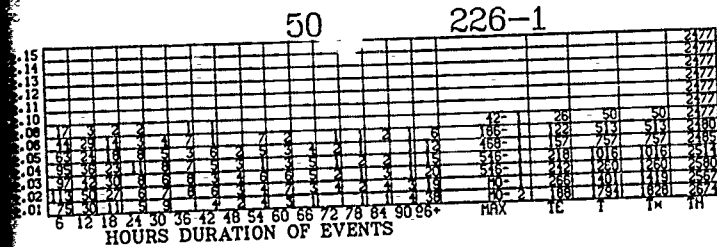
47 182-2



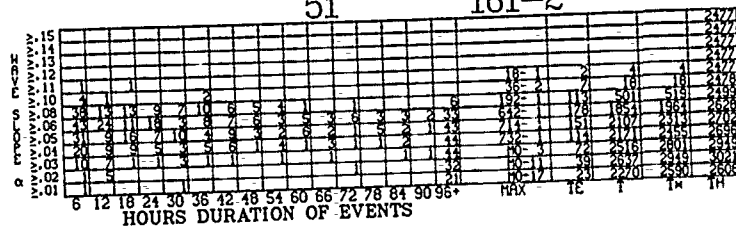
48 151-2



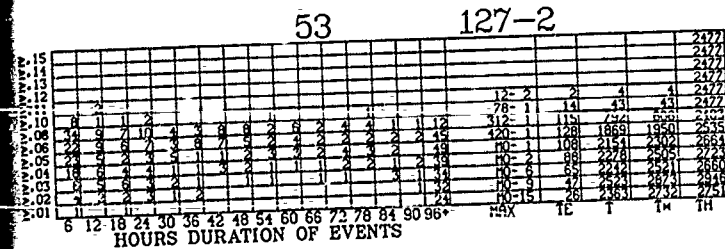
50 226-1



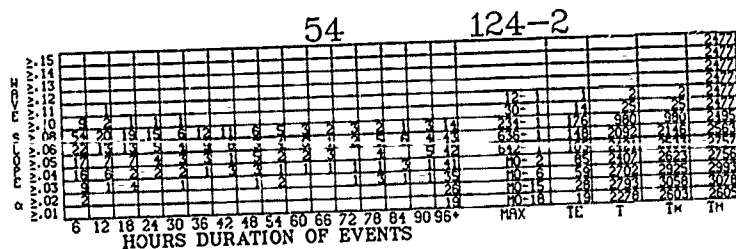
51 161-2



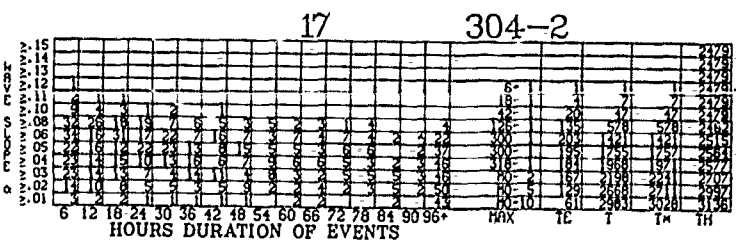
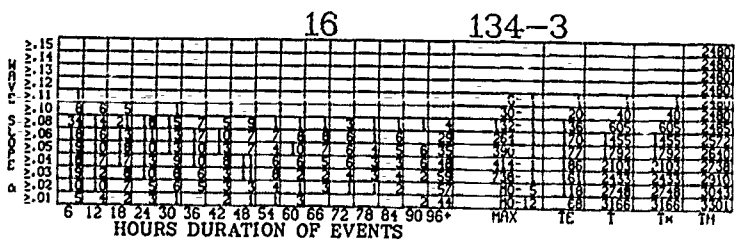
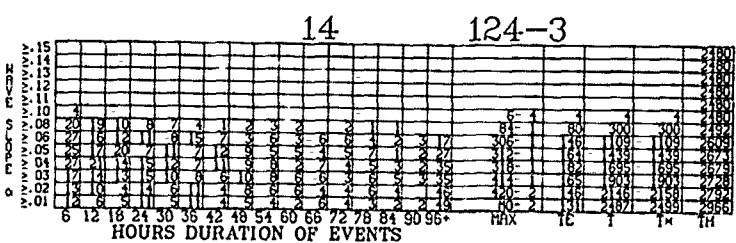
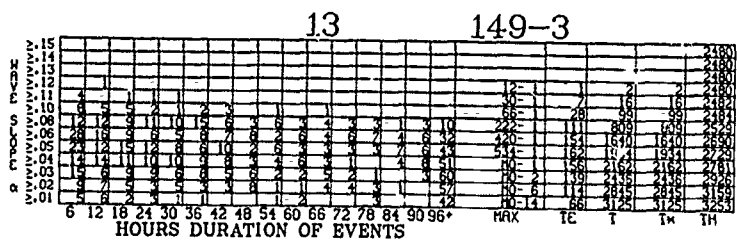
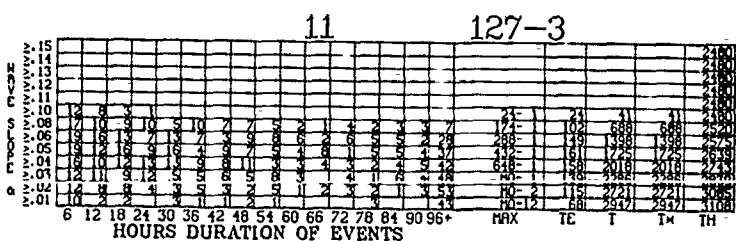
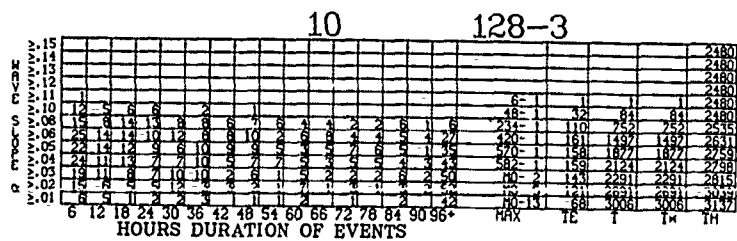
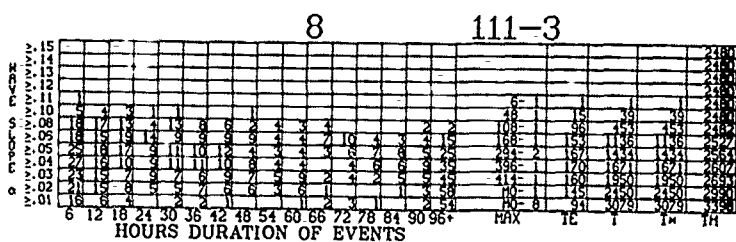
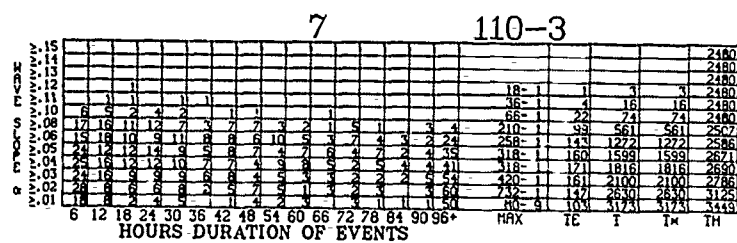
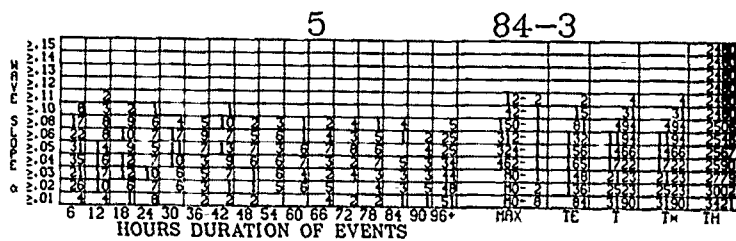
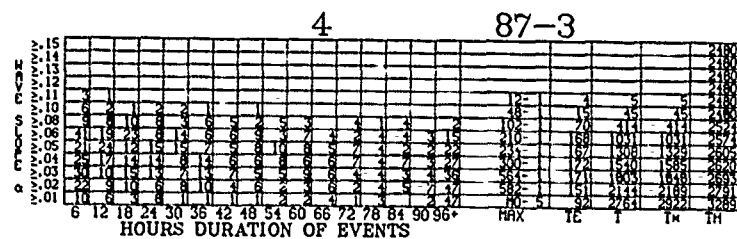
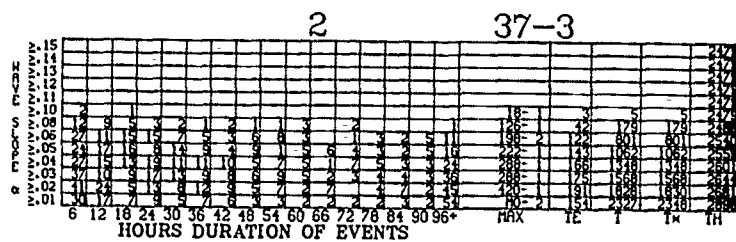
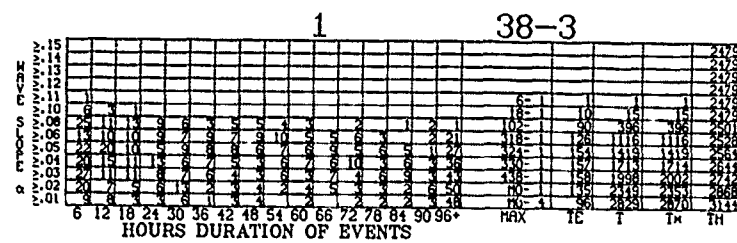
53 127-2



54 124-2



# WAVE SLOPE ( $\alpha$ ) DURATIONS



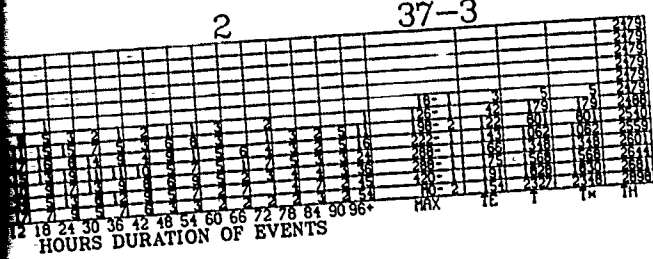
①



# AUGUST

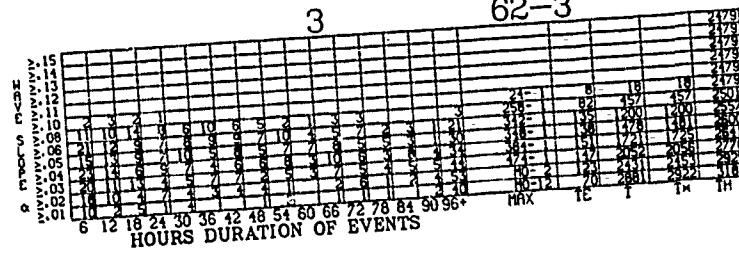
2

37-3



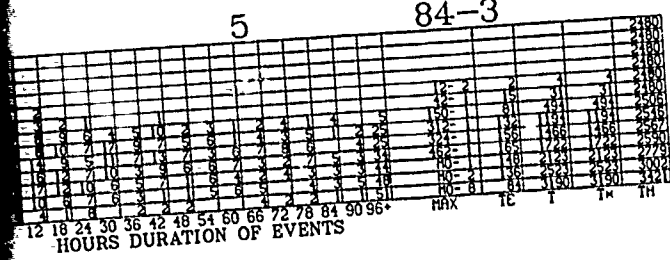
3

62-3



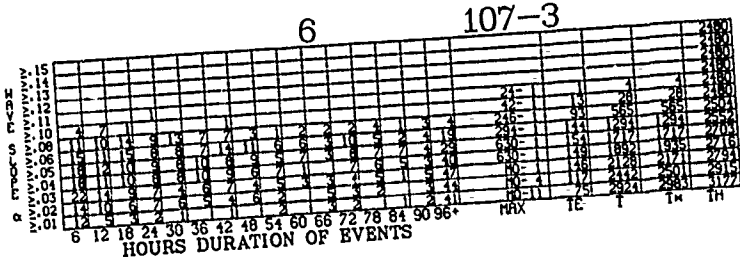
5

84-3



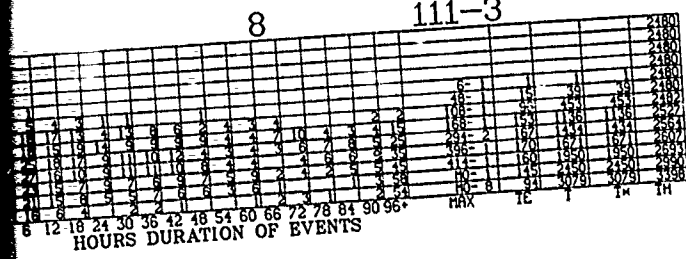
6

107-3



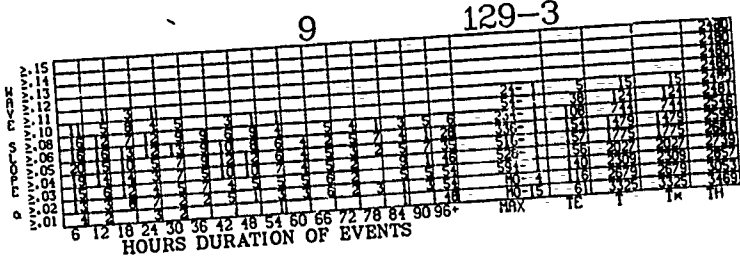
8

111-3



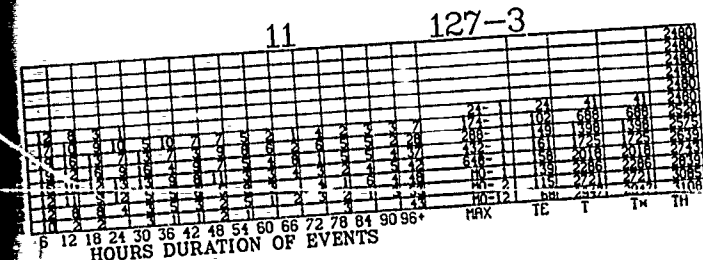
9

129-3



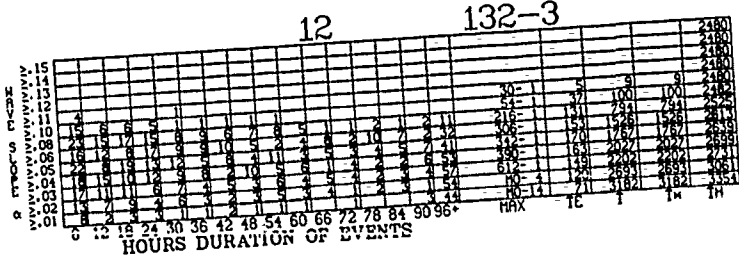
11

127-3



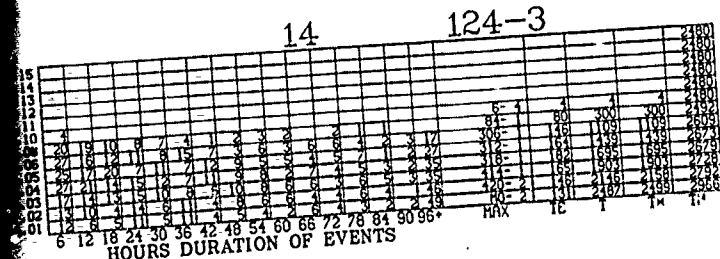
12

132-3



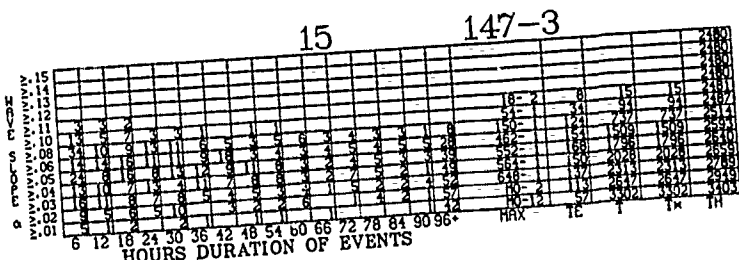
14

124-3



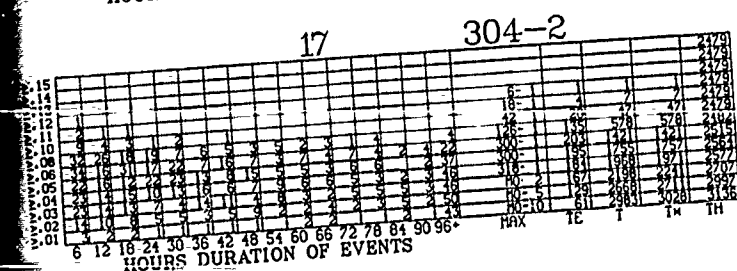
15

147-3



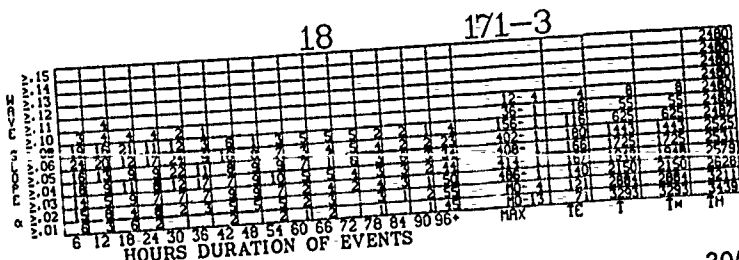
17

304-2



18

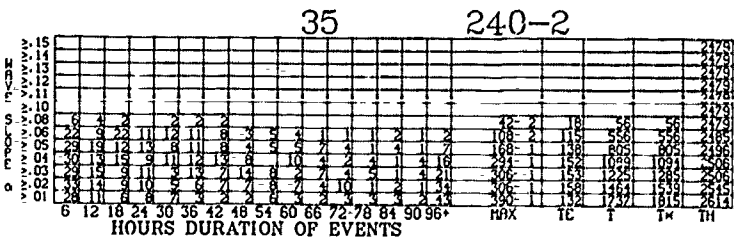
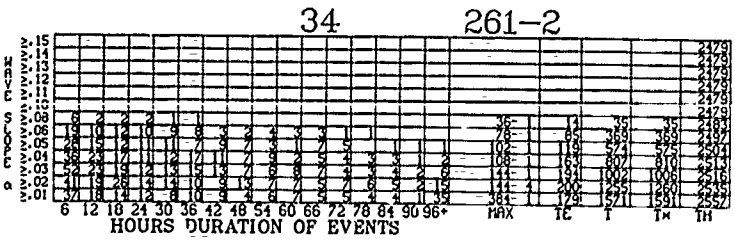
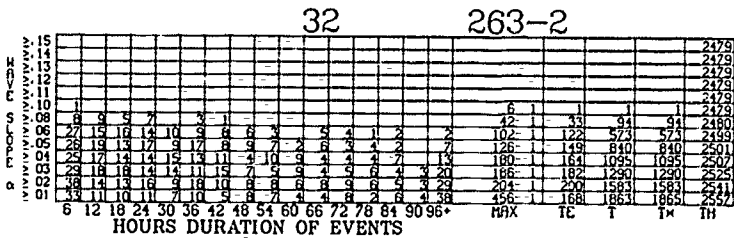
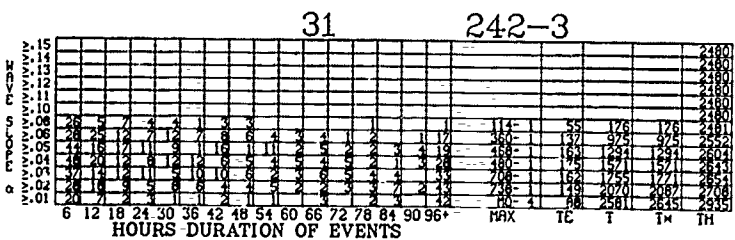
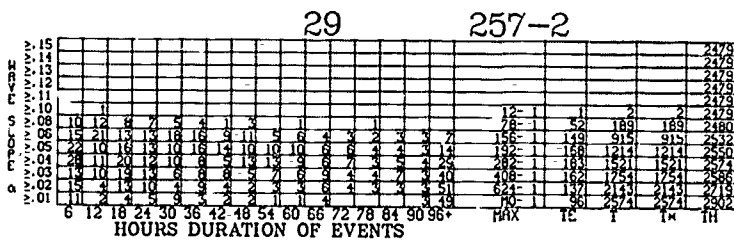
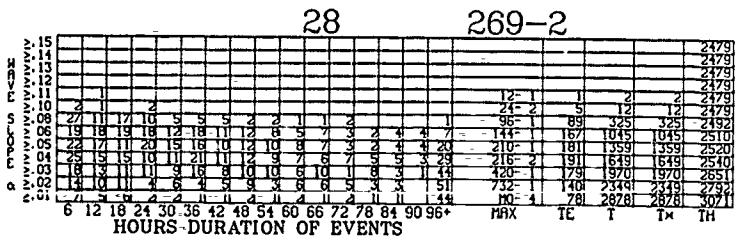
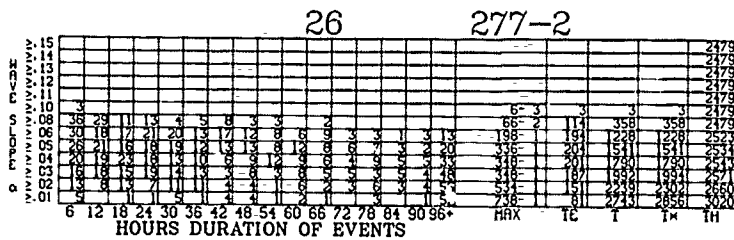
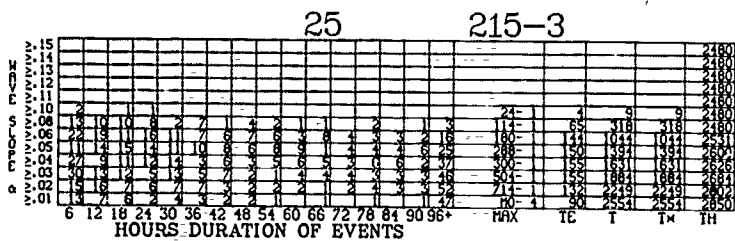
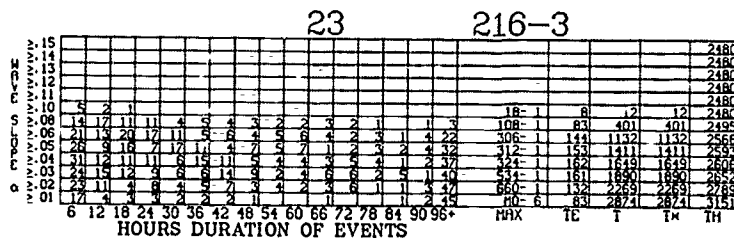
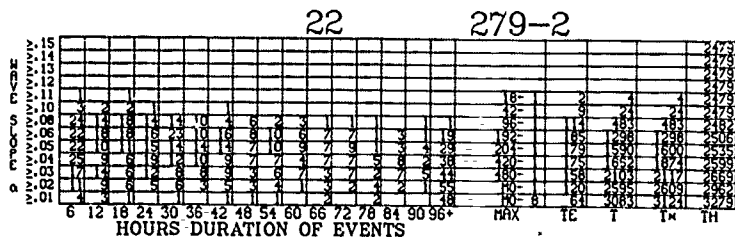
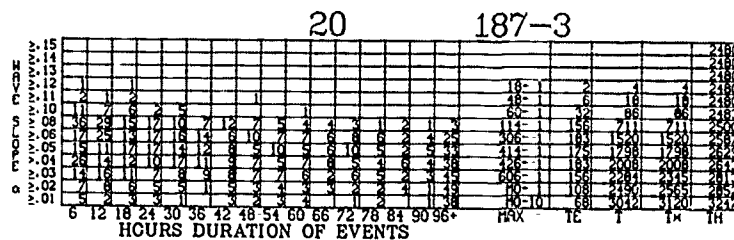
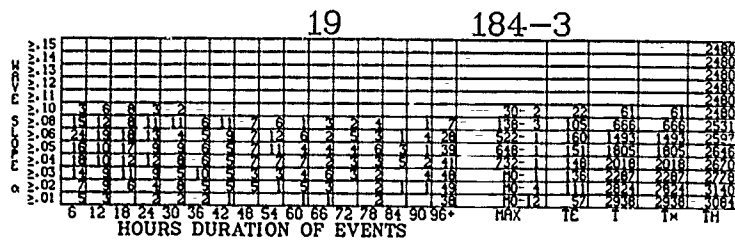
171-3





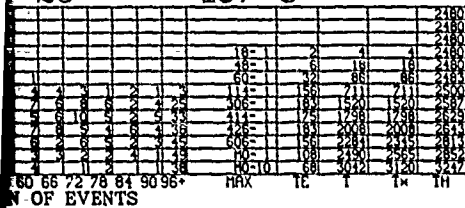
# AUGUST

# WAVE SL

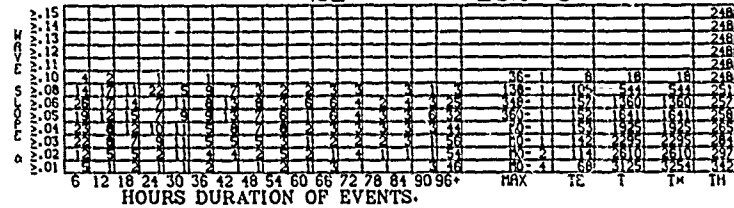


# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)

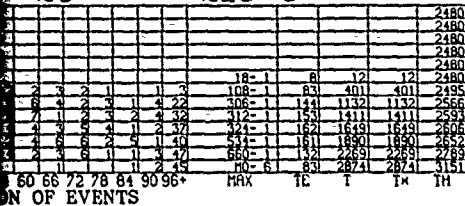
20 187-3



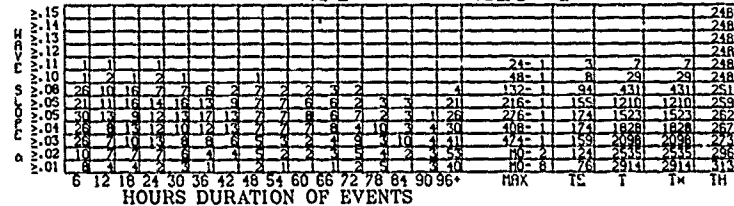
21 182-3



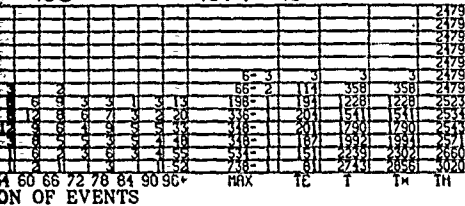
23 216-3



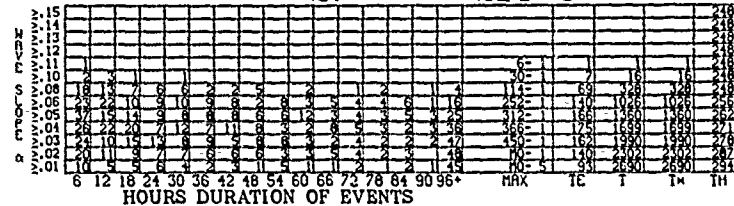
24 218-3



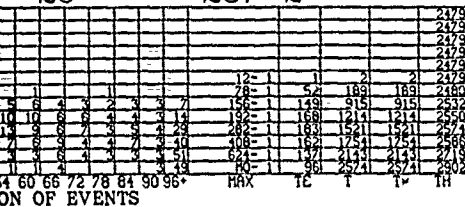
26 277-2



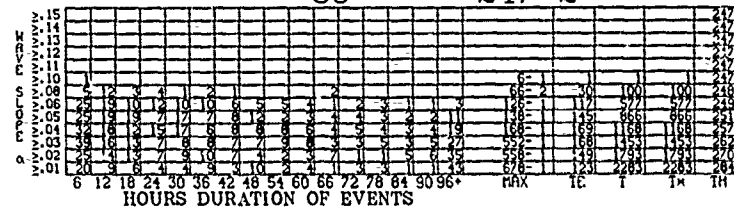
27 214-3



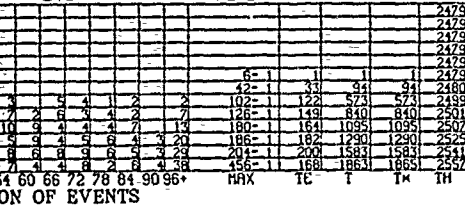
29 257-2



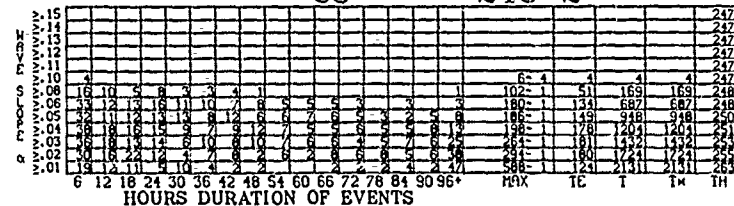
30 247-2



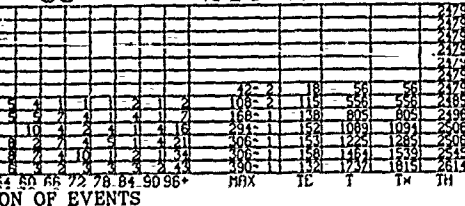
32 263-2



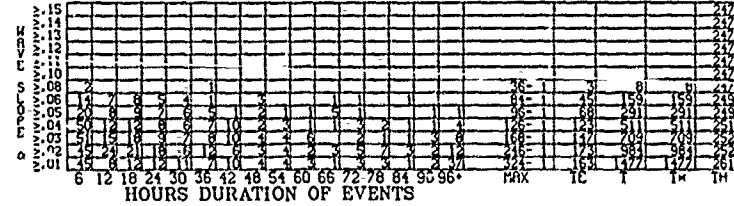
33 243-2



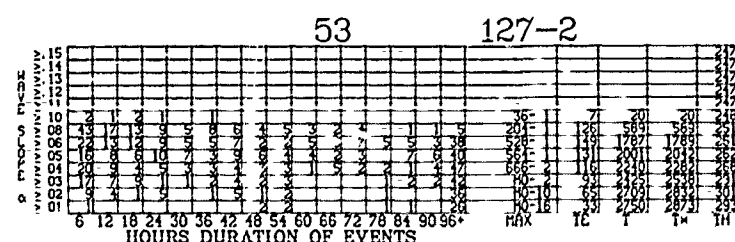
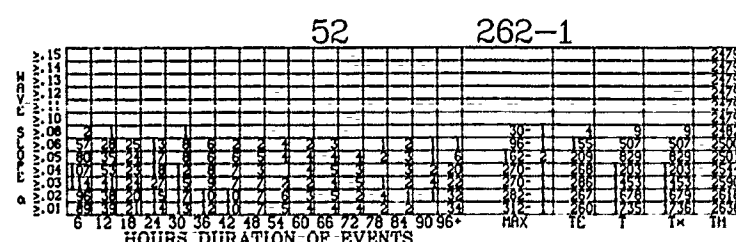
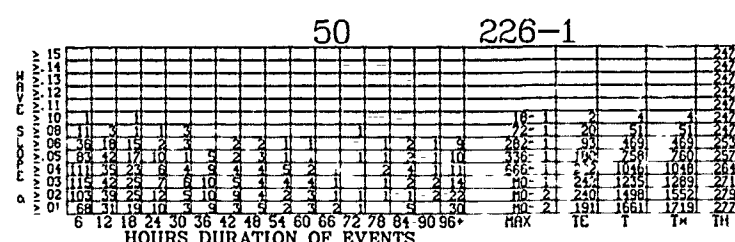
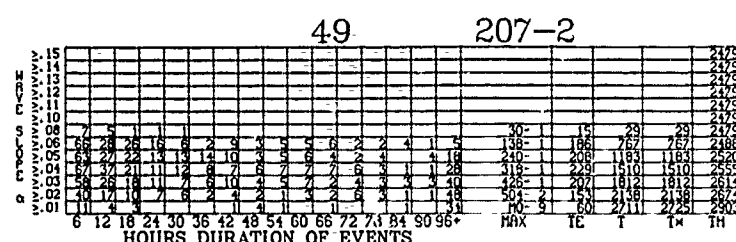
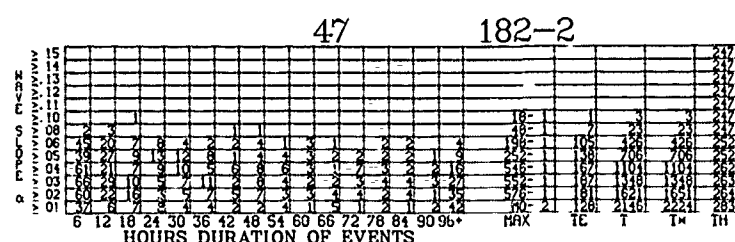
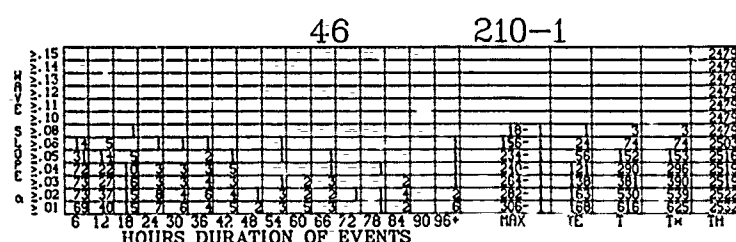
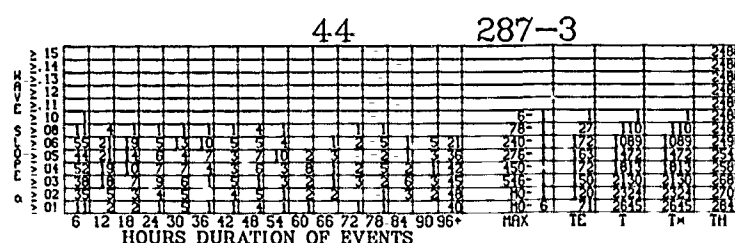
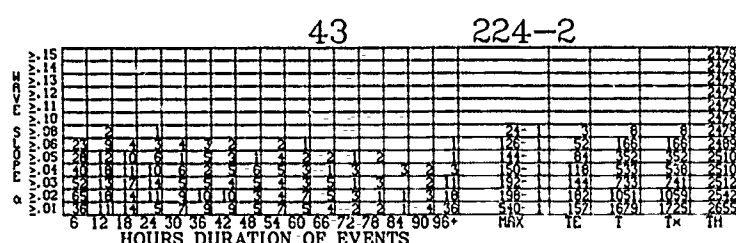
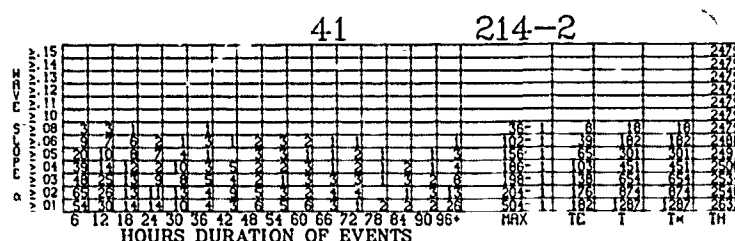
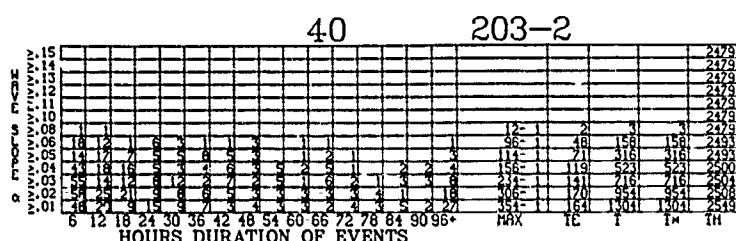
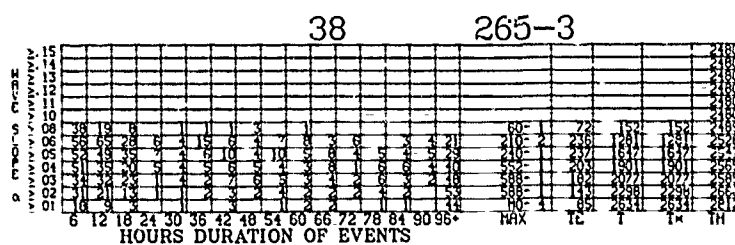
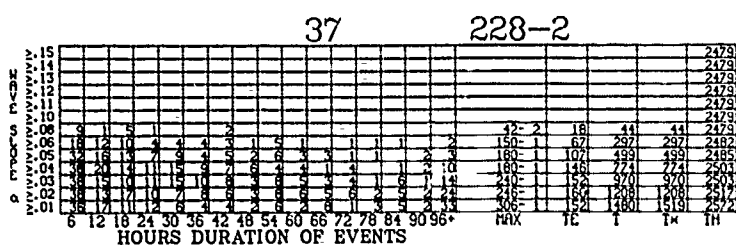
35 240-2



36 220-2



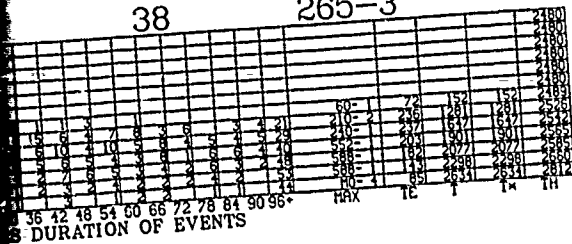
# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



# AUGUST

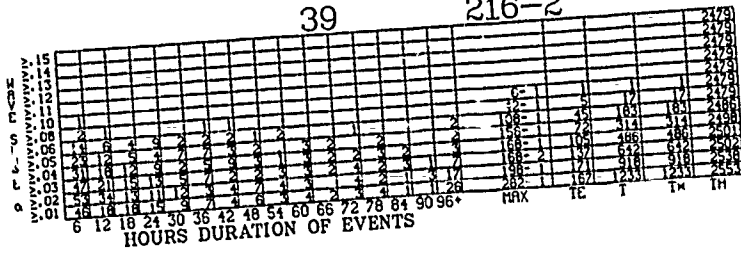
38

265-3



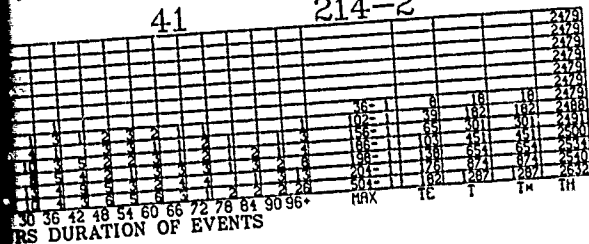
39

216-2



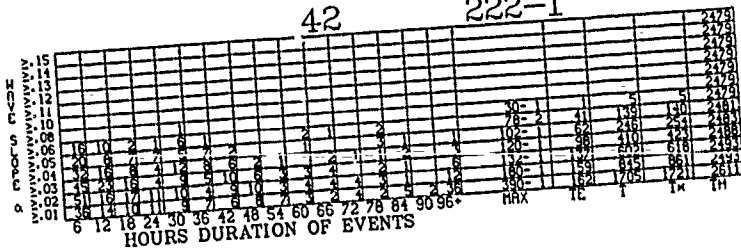
41

214-2



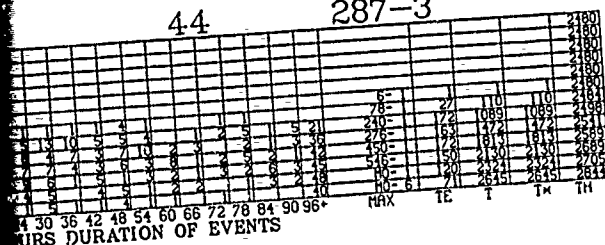
42

222-1



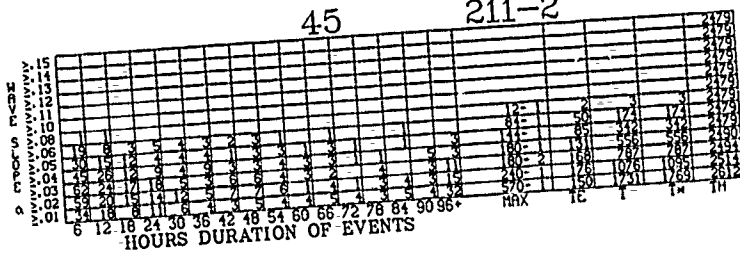
44

287-3



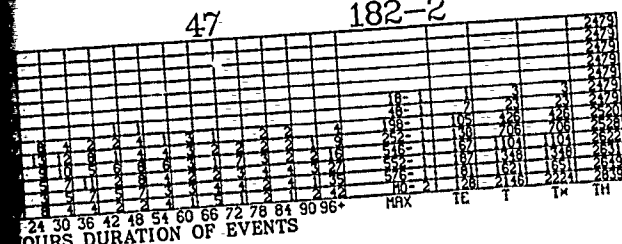
45

211-2



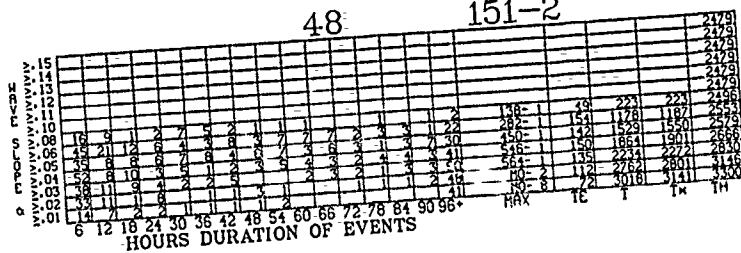
47

182-2



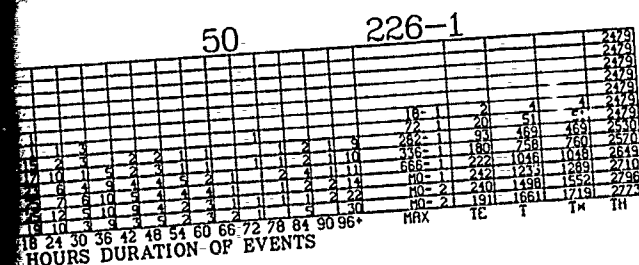
48

151-2



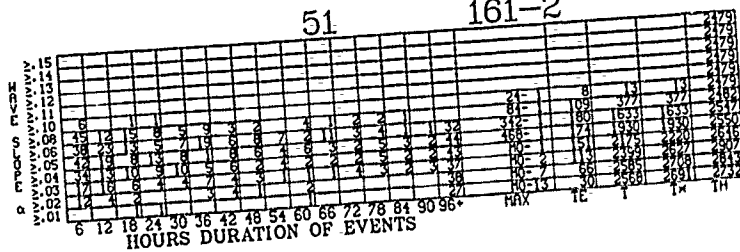
50

226-1



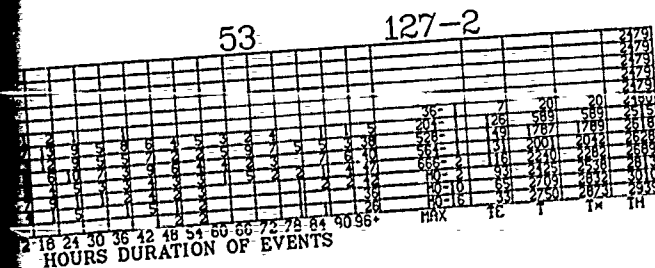
51

161-2



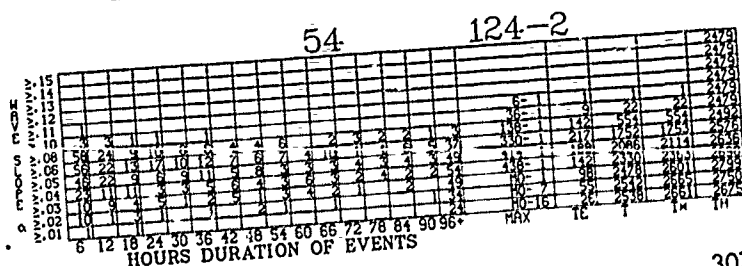
53

127-2

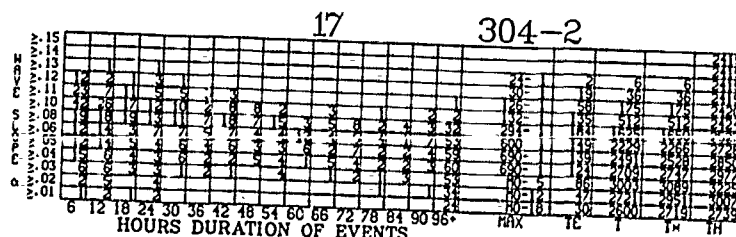
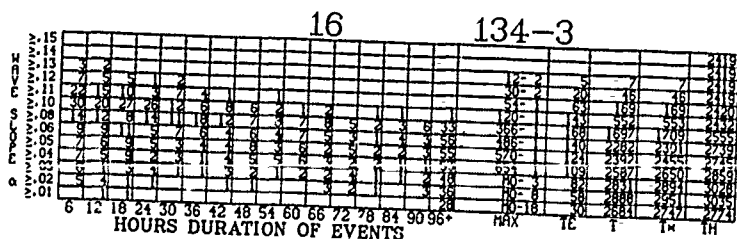
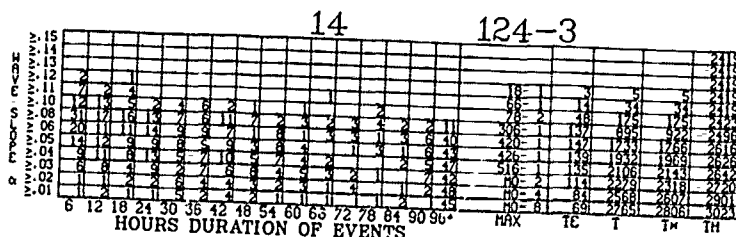
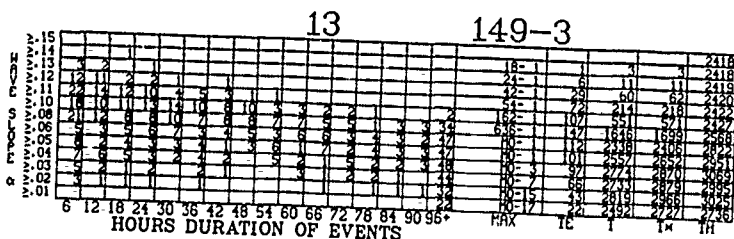
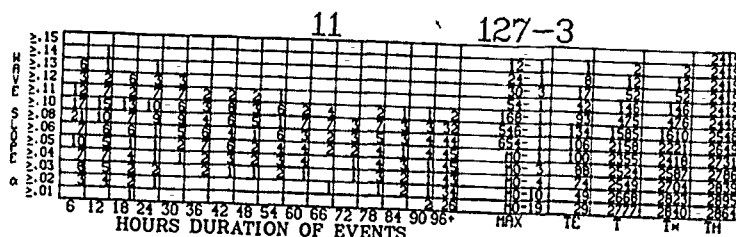
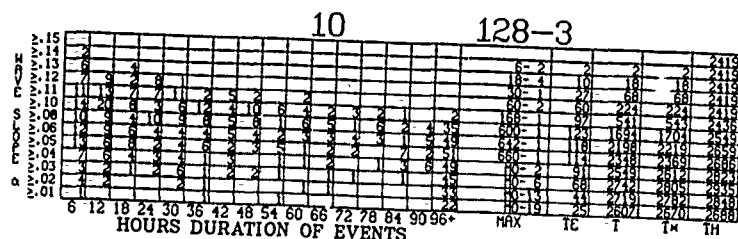
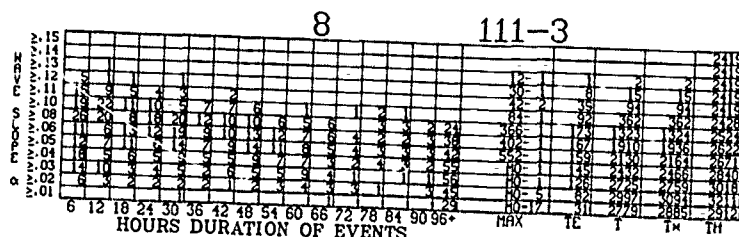
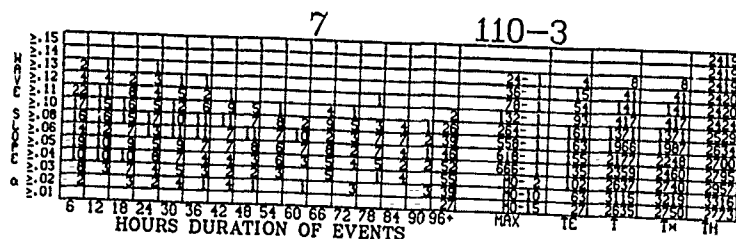
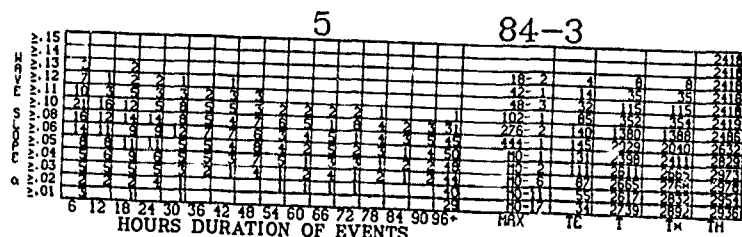
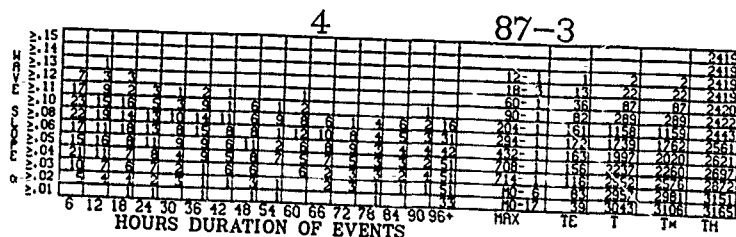
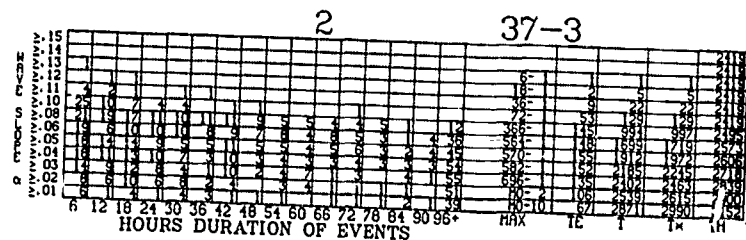
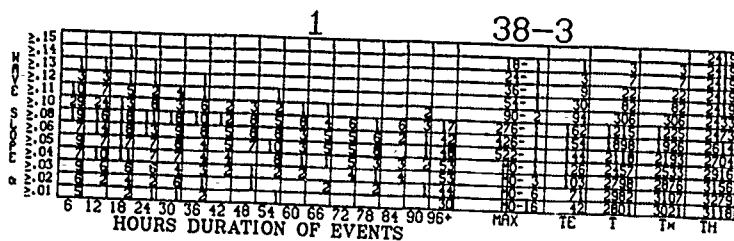


54

124-2

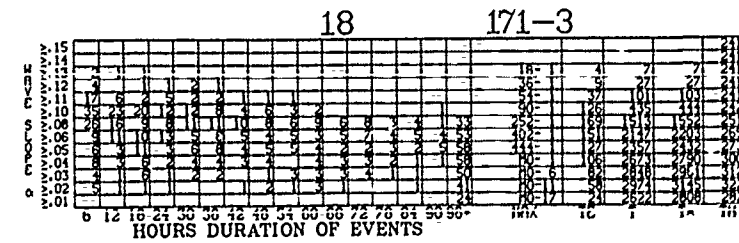
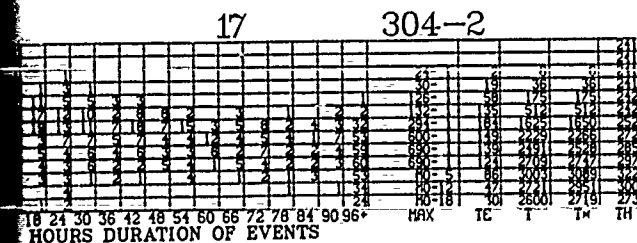
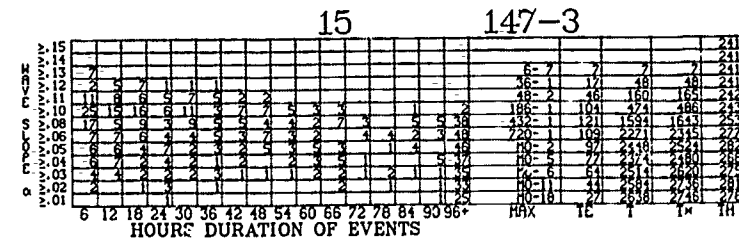
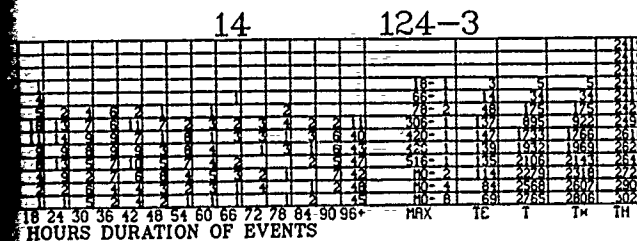
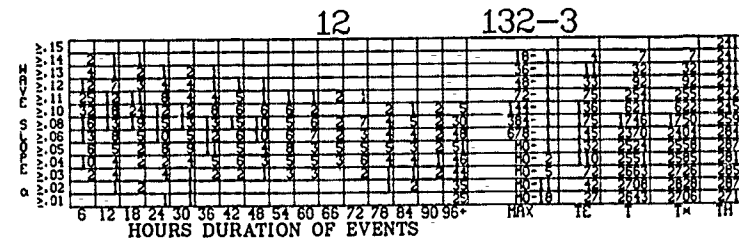
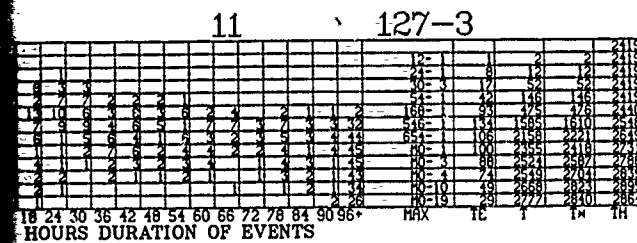
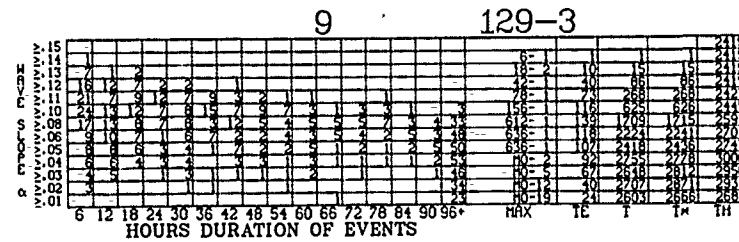
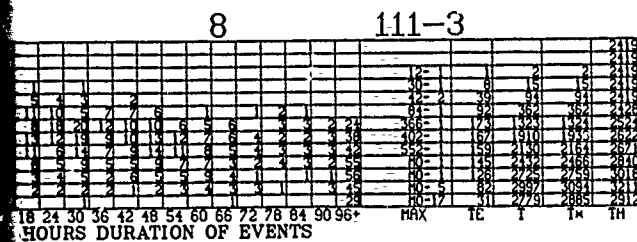
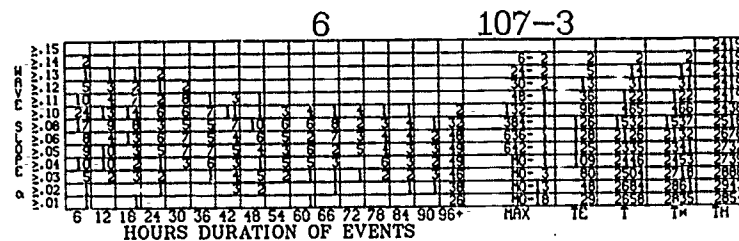
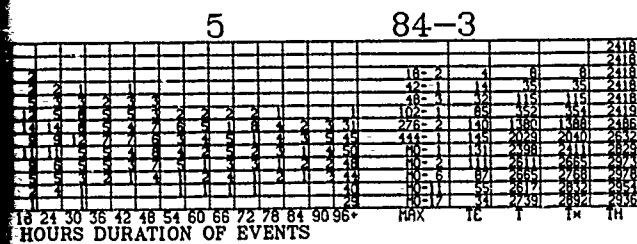
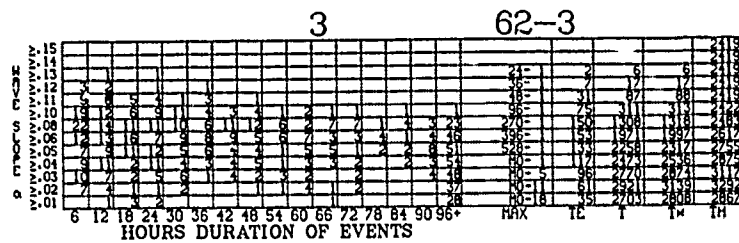
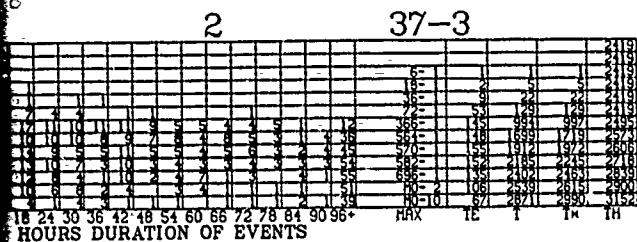


# OCTOBER



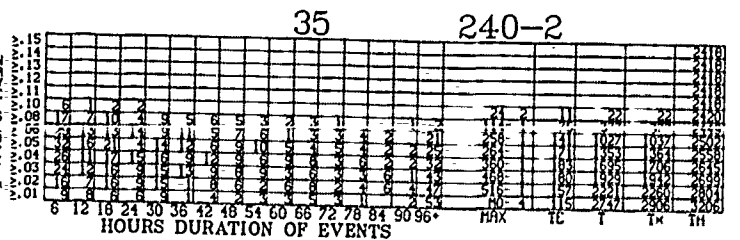
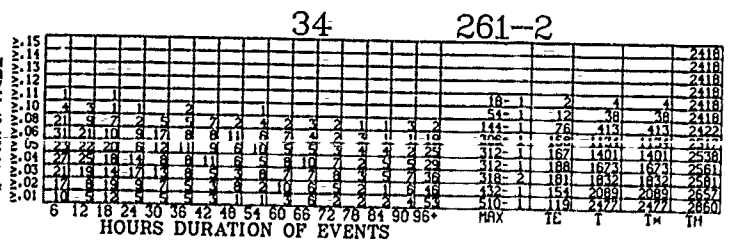
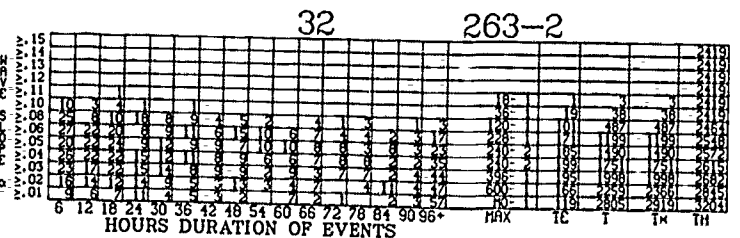
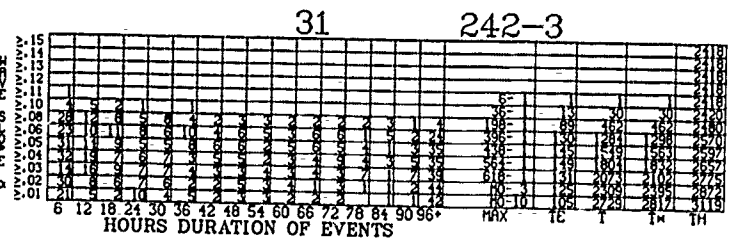
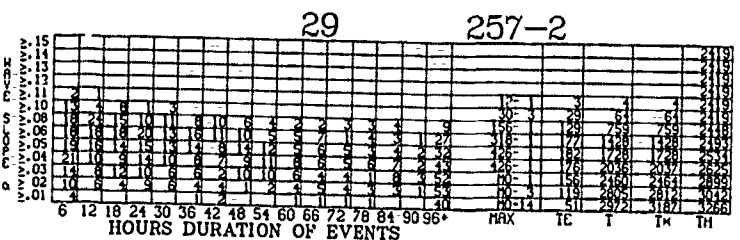
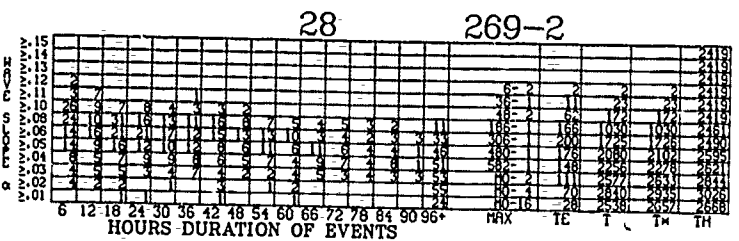
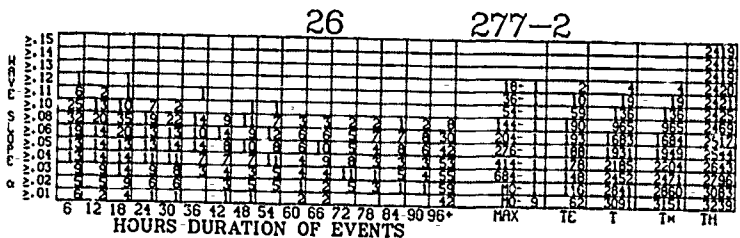
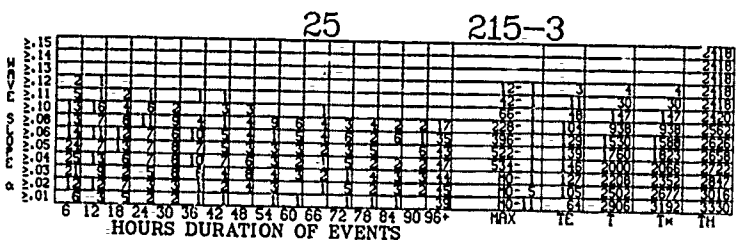
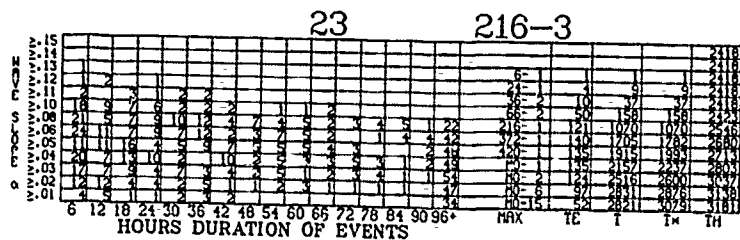
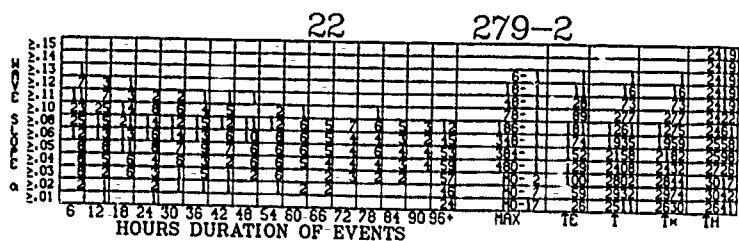
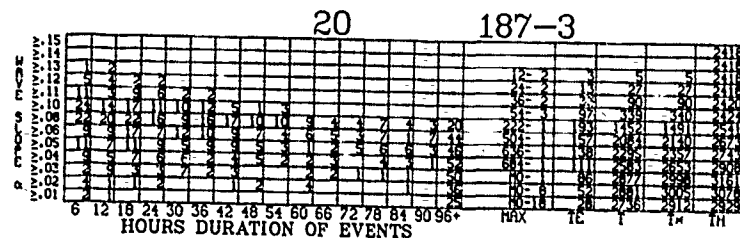
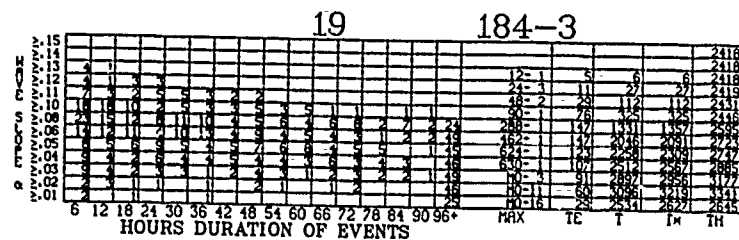


# WAVE SLOPE ( $\alpha$ ) DURATIONS



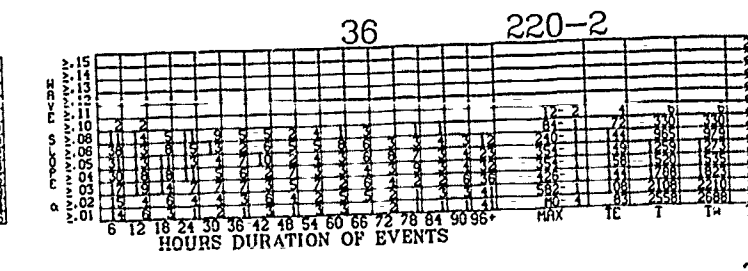
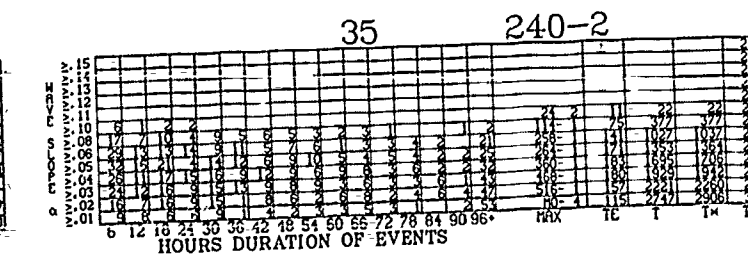
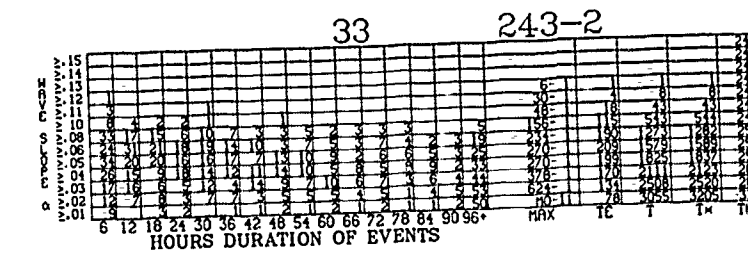
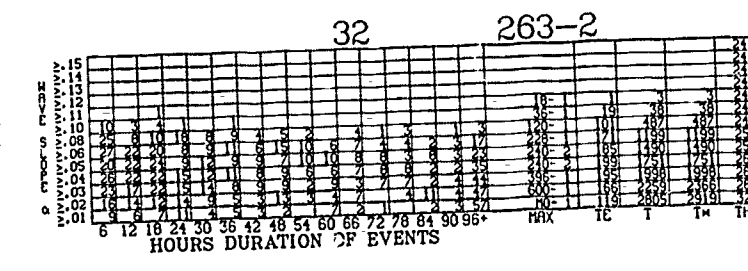
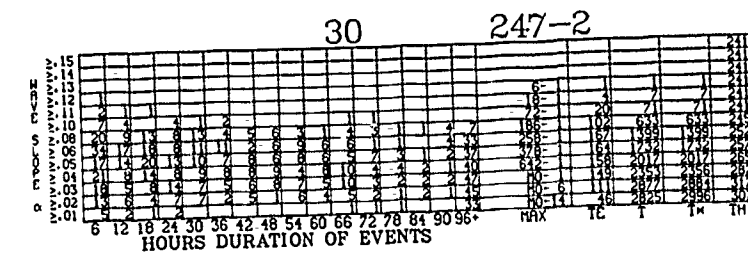
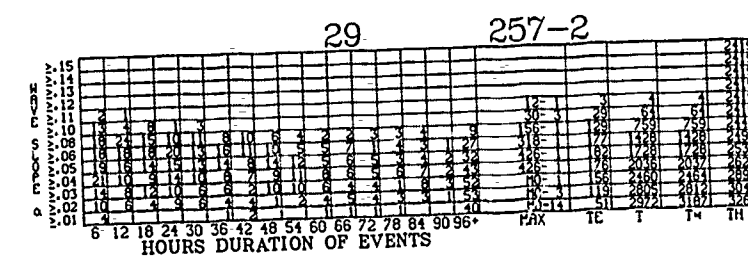
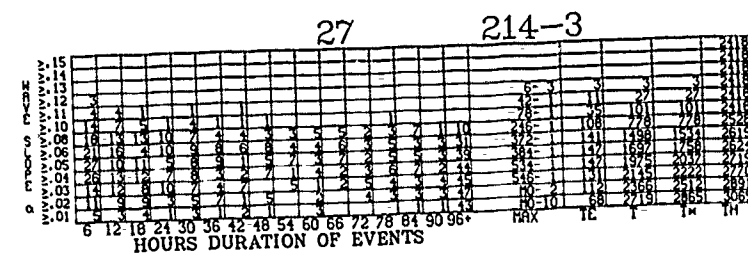
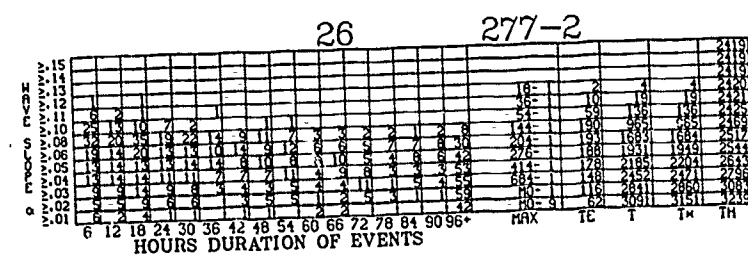
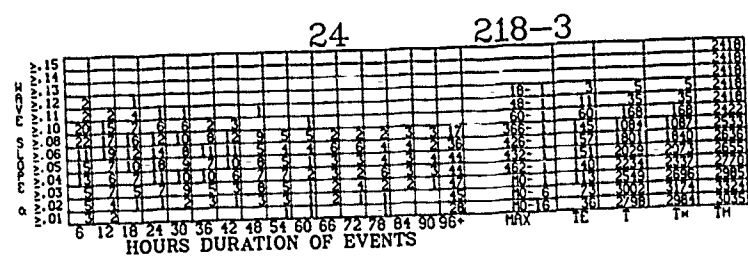
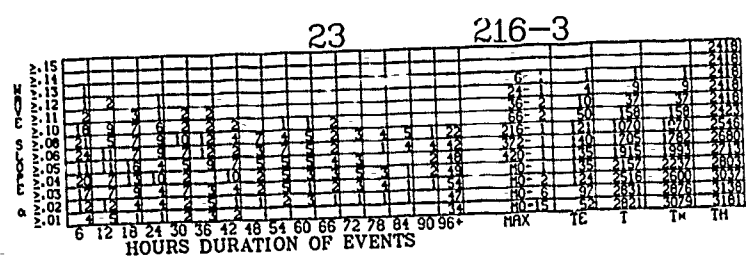
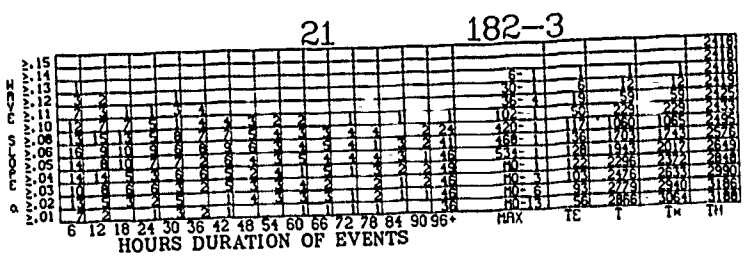
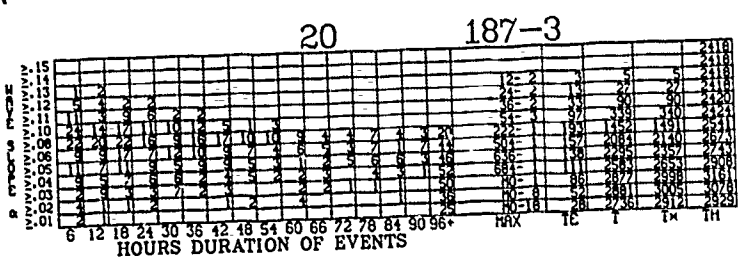


# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



(Cont'd)

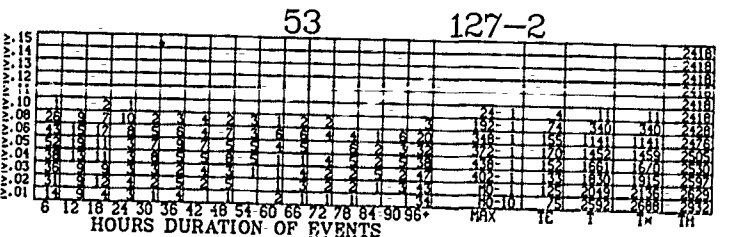
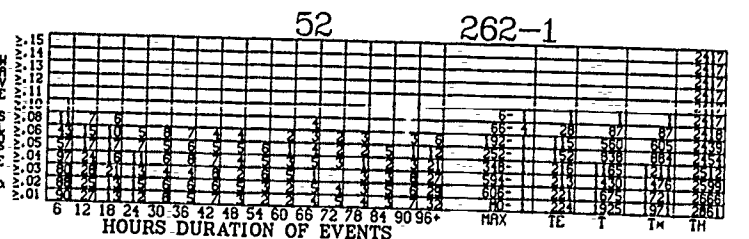
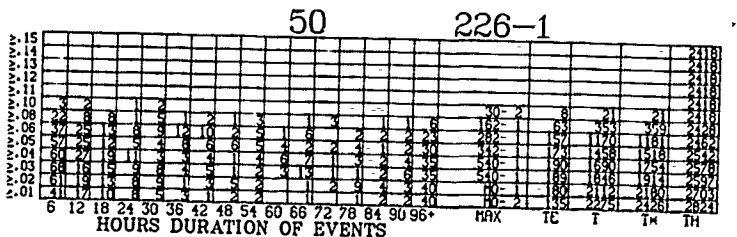
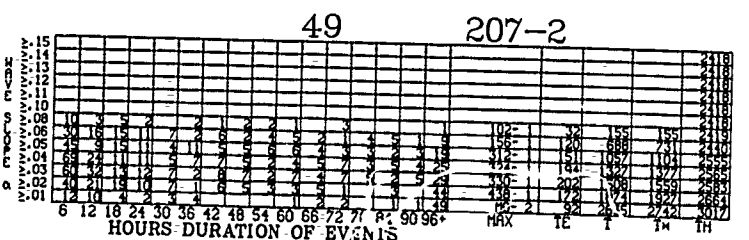
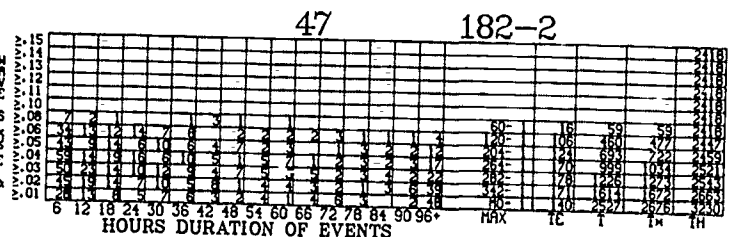
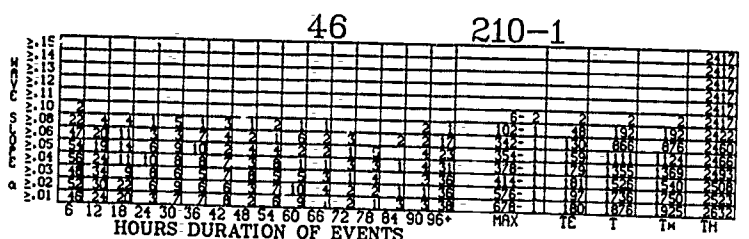
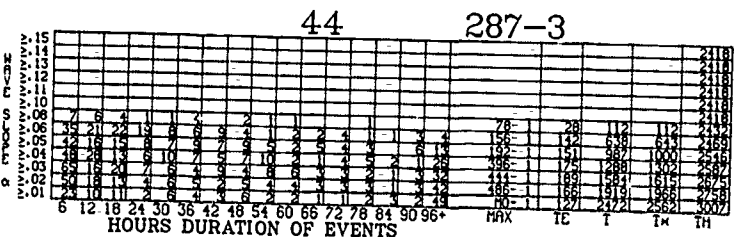
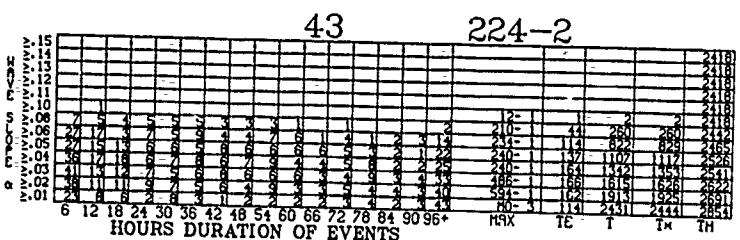
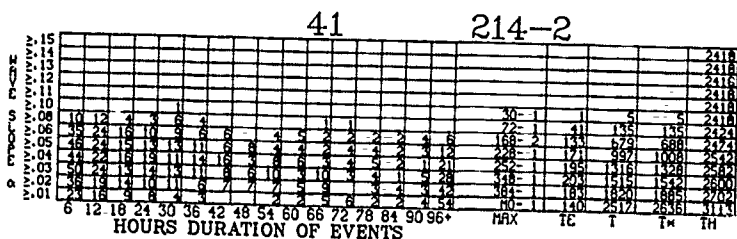
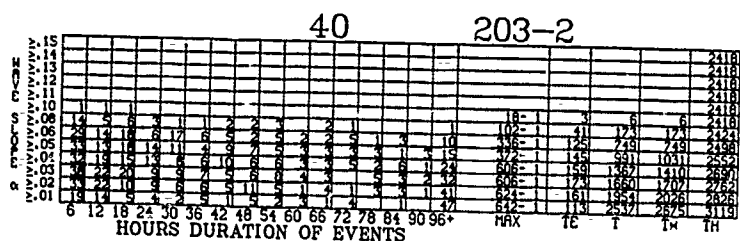
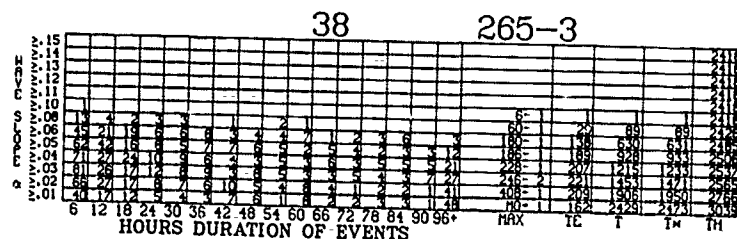
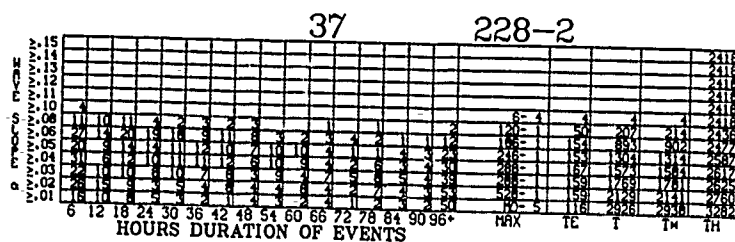
OCTOBER



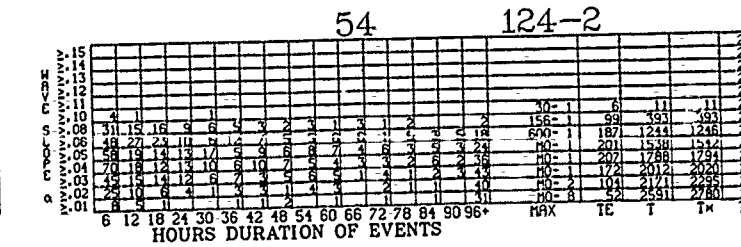
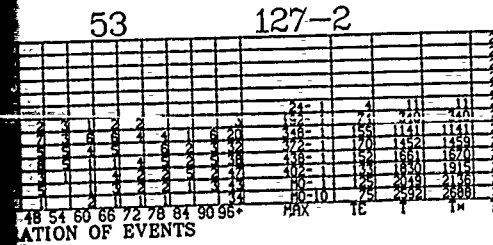
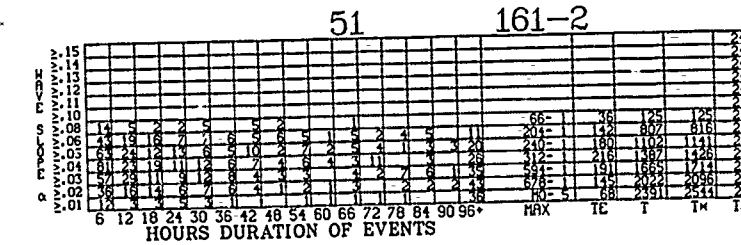
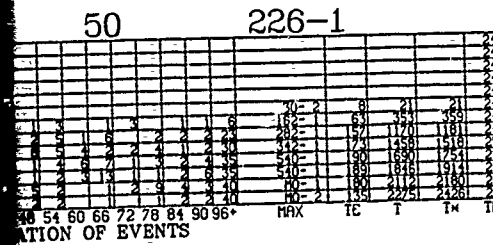
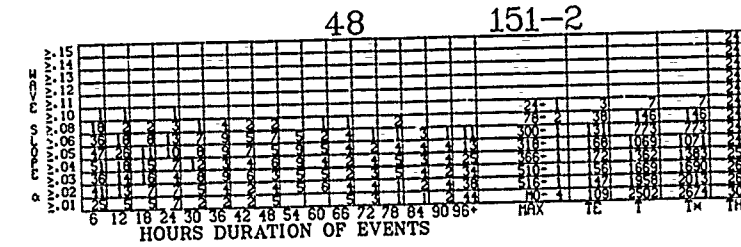
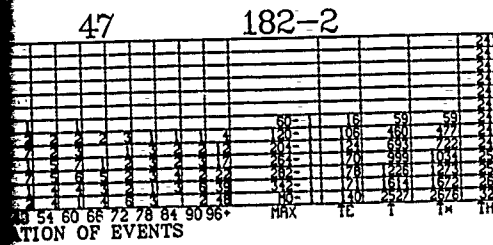
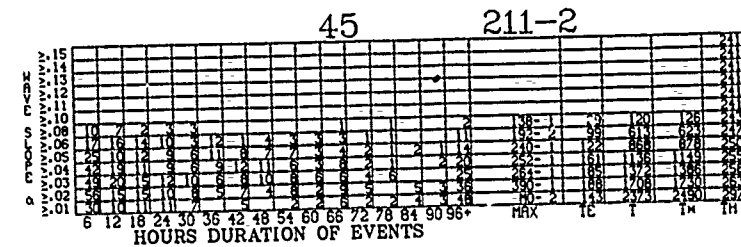
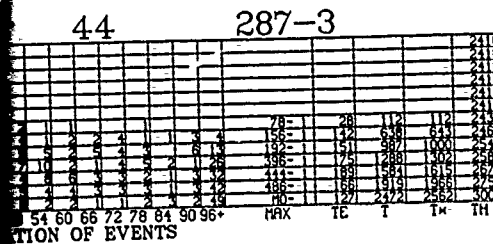
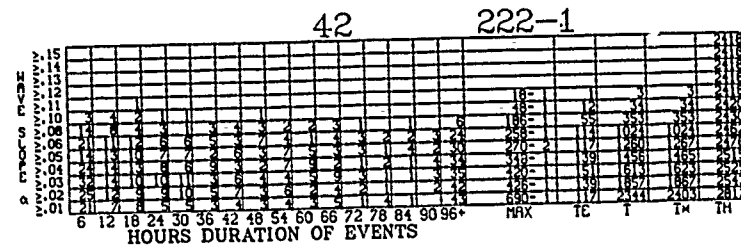
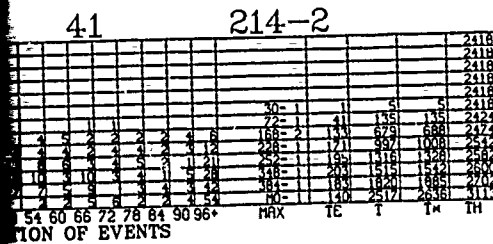
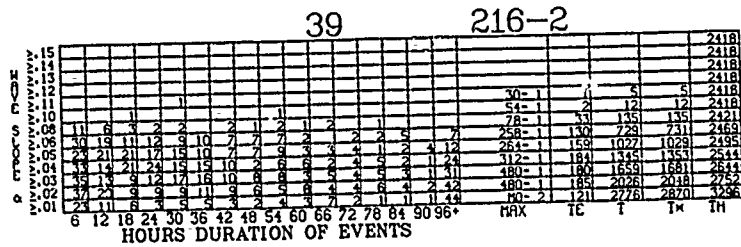
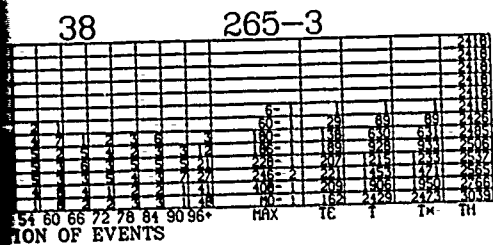
2

# OCTOBER

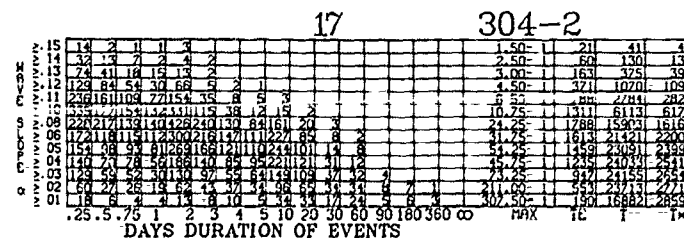
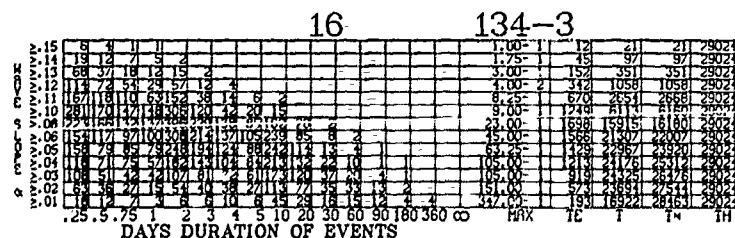
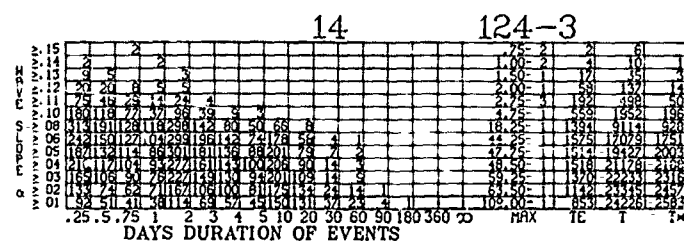
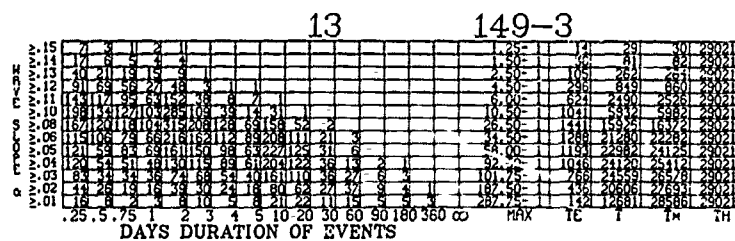
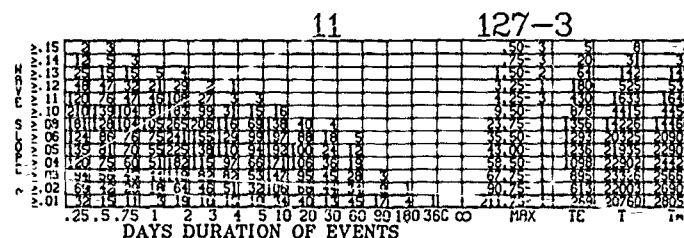
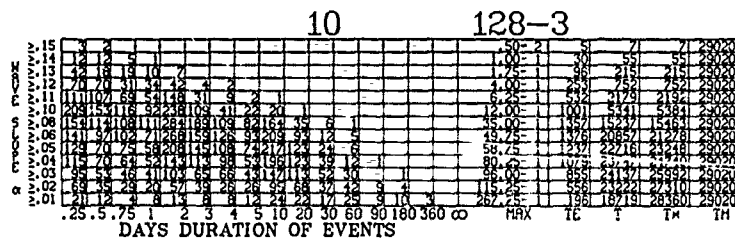
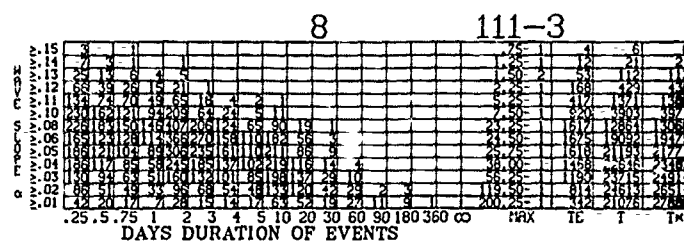
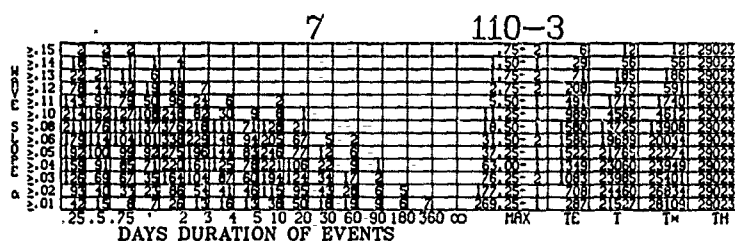
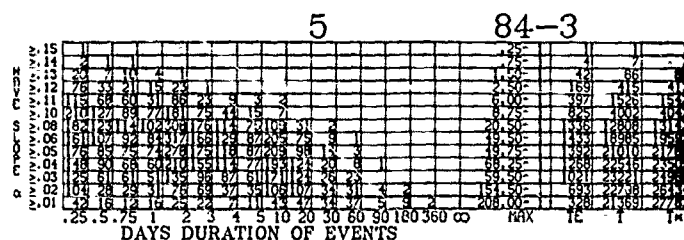
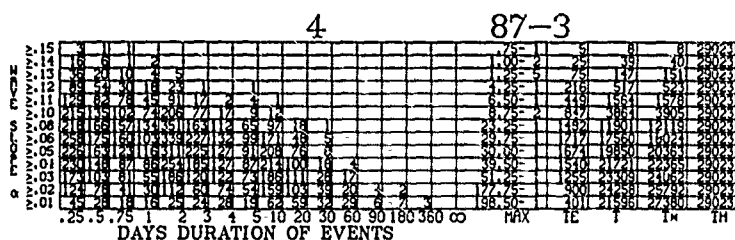
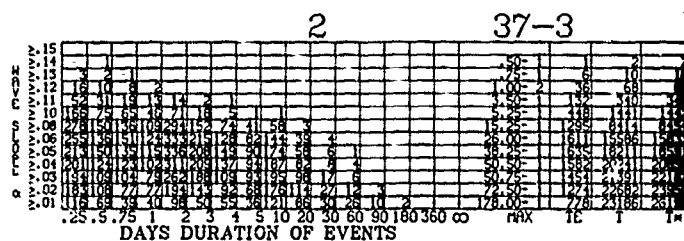
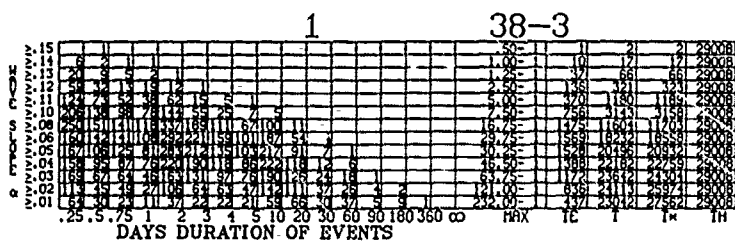
# WAVE



# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



# WAVE SLOPE ( $\alpha$ ) DURATIONS

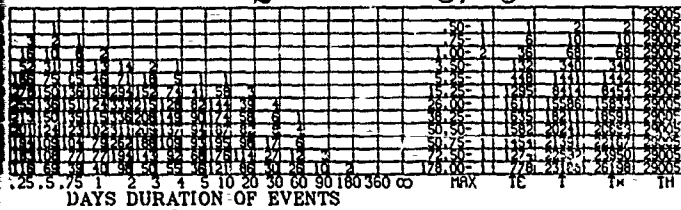


①

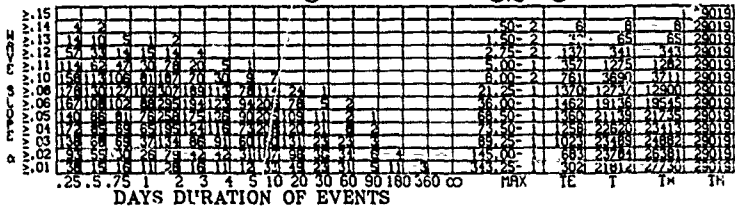


# ALL DAYS

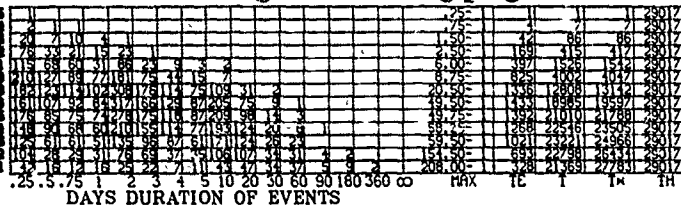
2 37-3



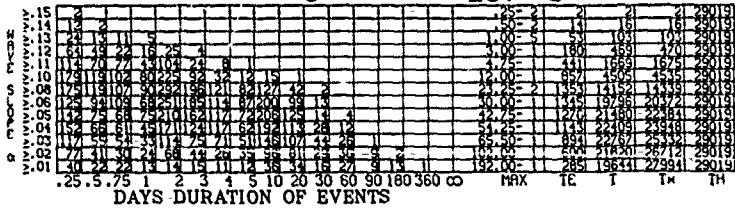
3 62-3



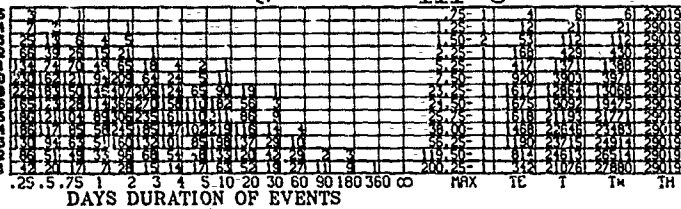
5 84-3



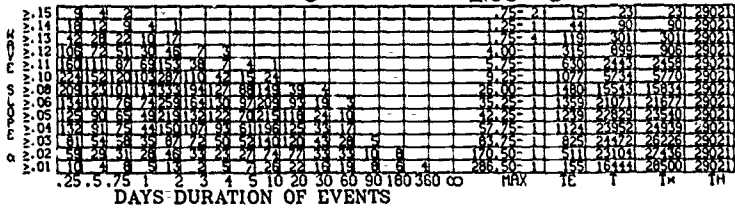
6 107-3



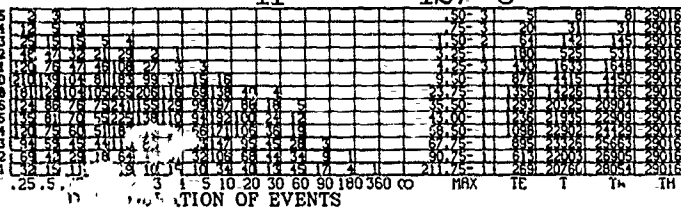
8 111-3



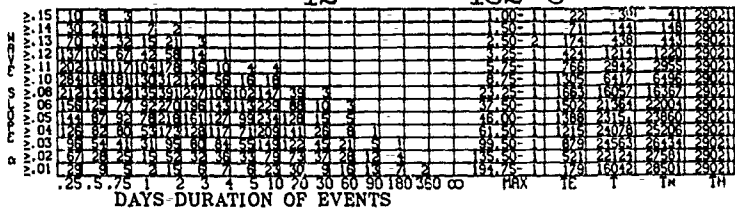
9 129-3



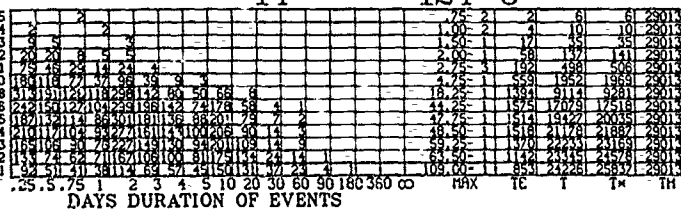
11 127-3



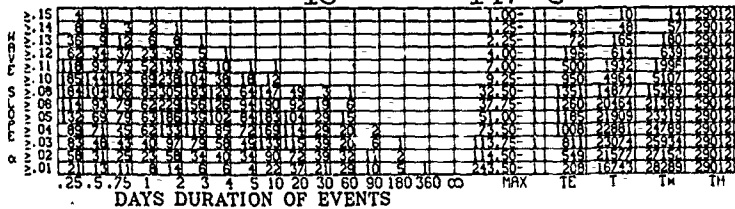
12 132-3



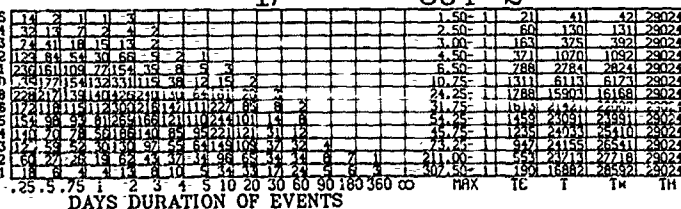
14 124-3



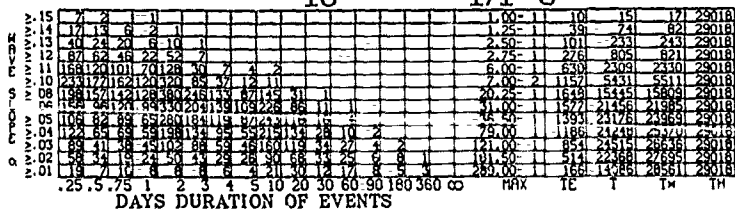
15 147-3



17 304-2



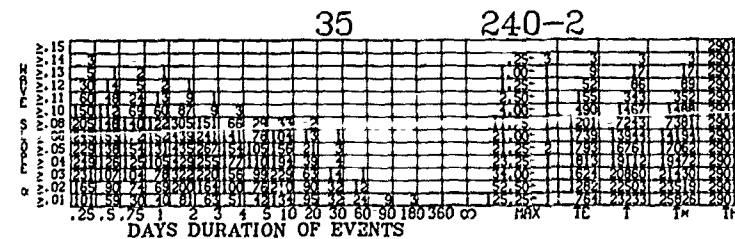
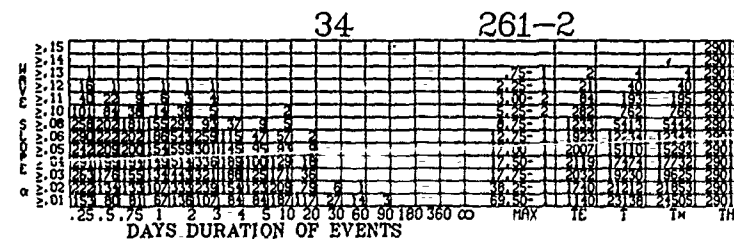
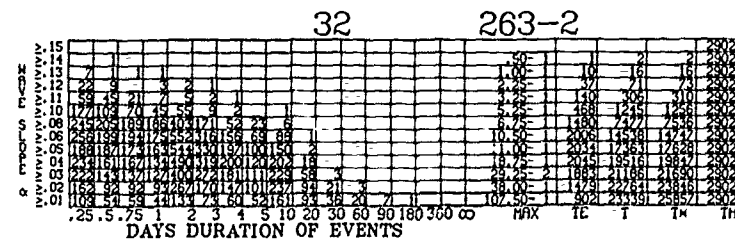
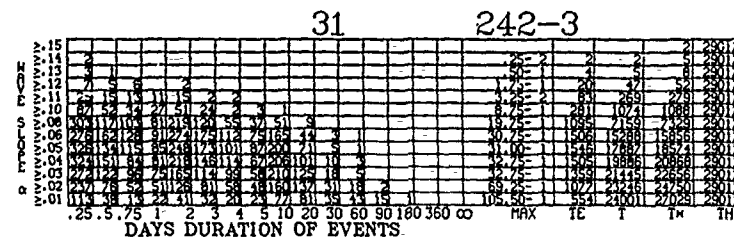
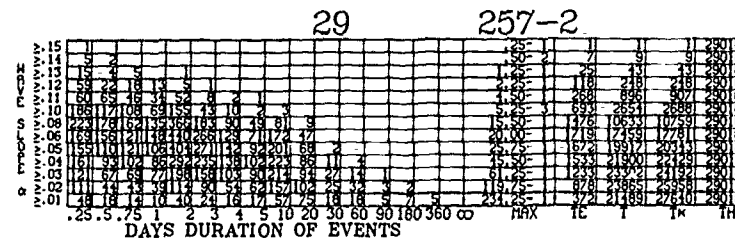
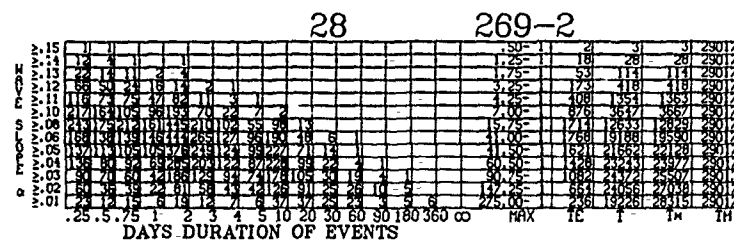
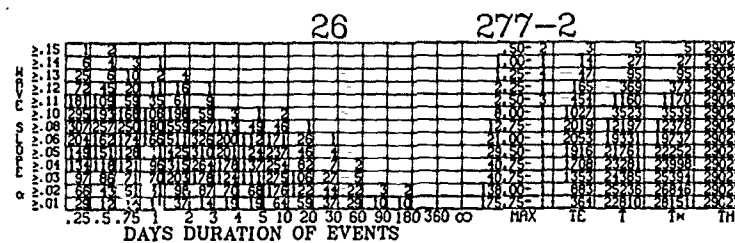
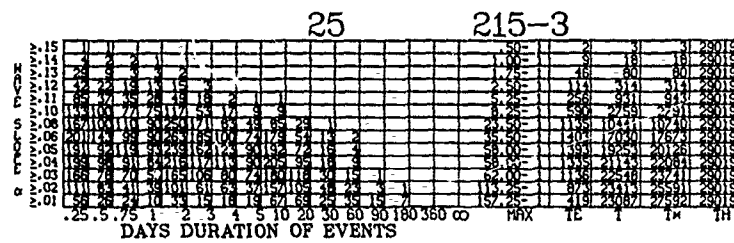
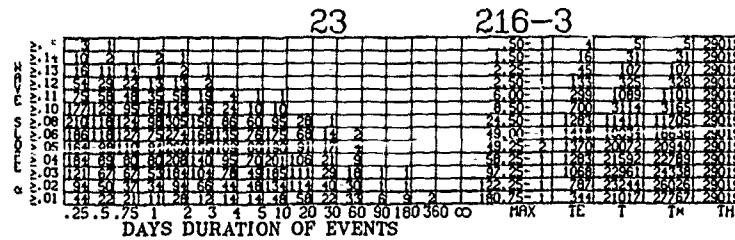
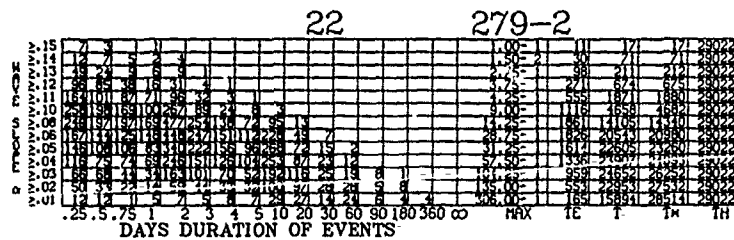
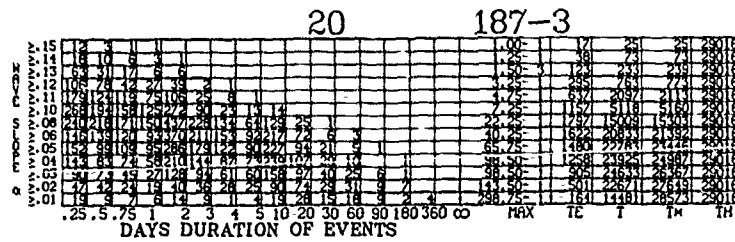
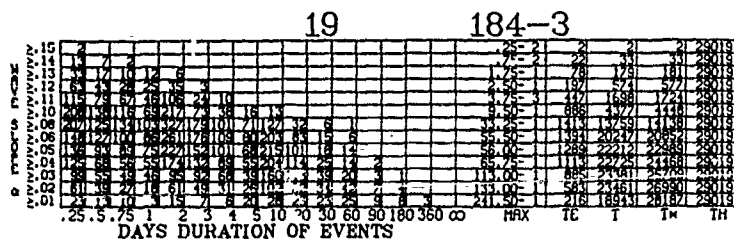
18 171-3



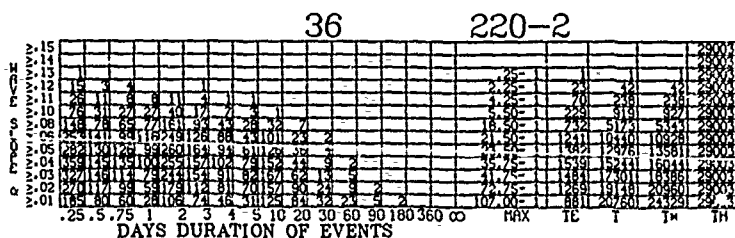
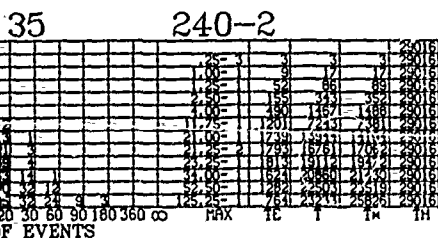
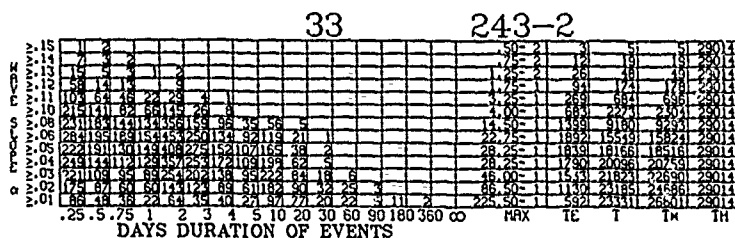
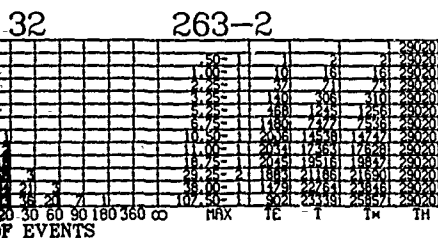
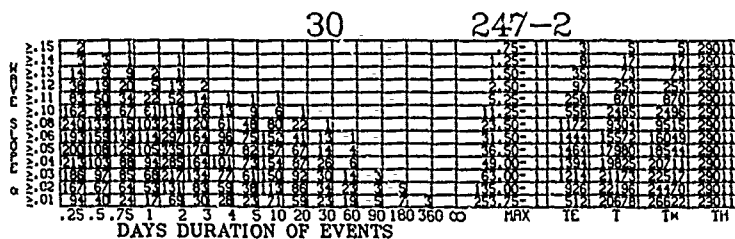
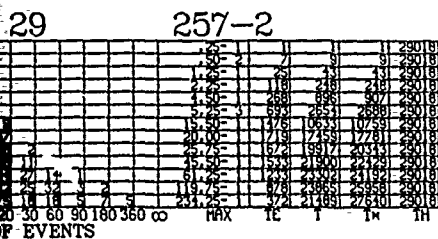
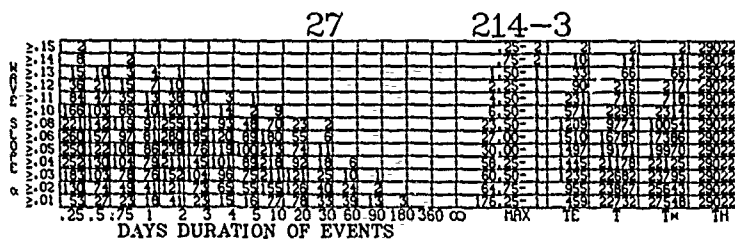
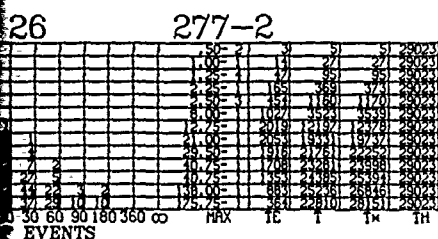
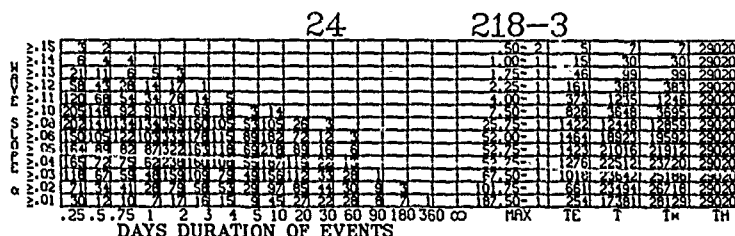
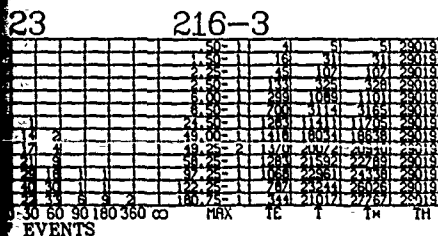
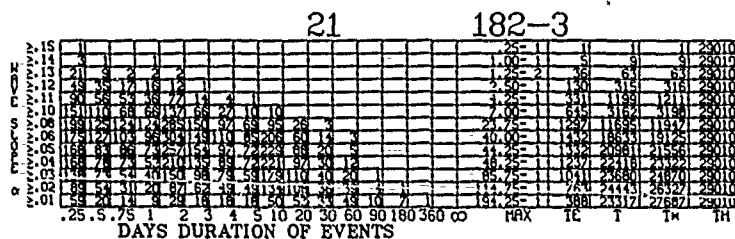
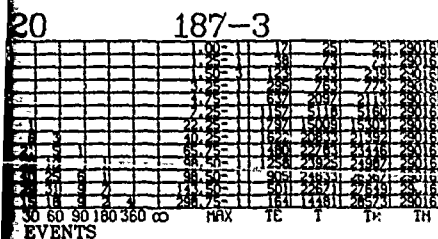


# ALL DAYS

# WAVE SI

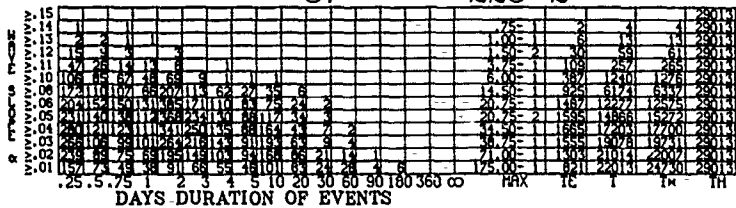


# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)

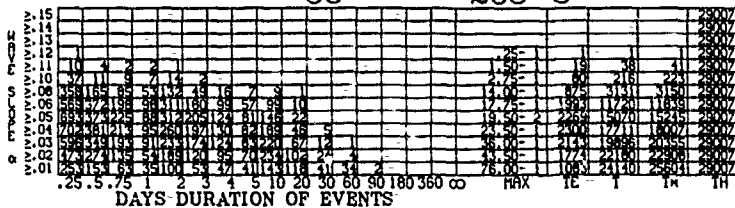


# WAVE SLOPE ( $\alpha$ ) DURATIONS (Cont'd)

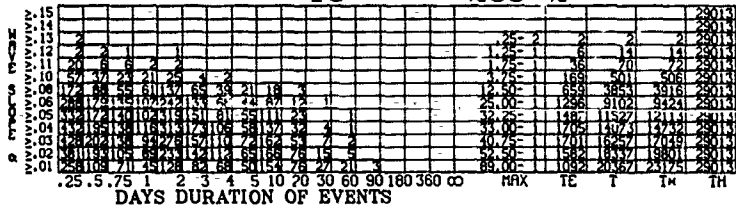
37 228-2



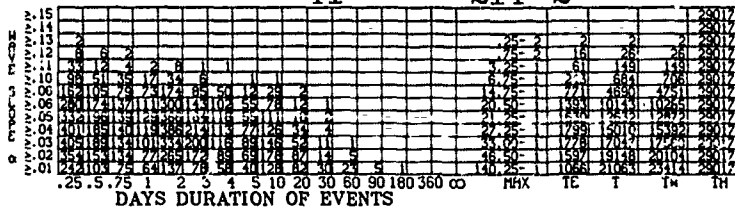
38 265-3



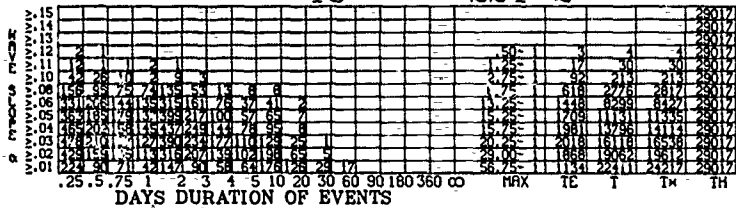
40 203-2



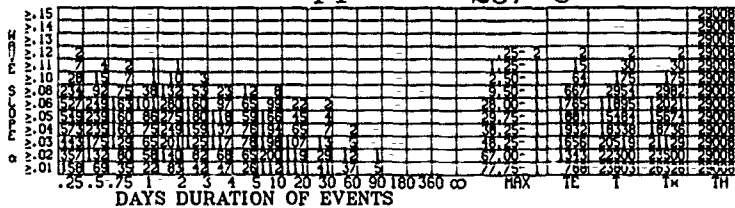
41 214-2



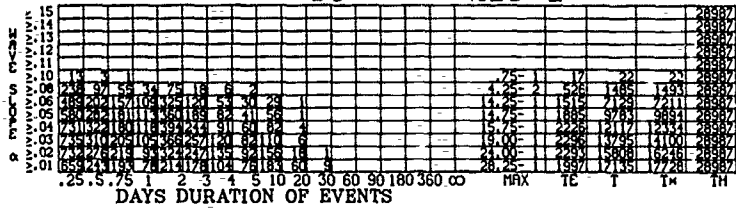
43 224-2



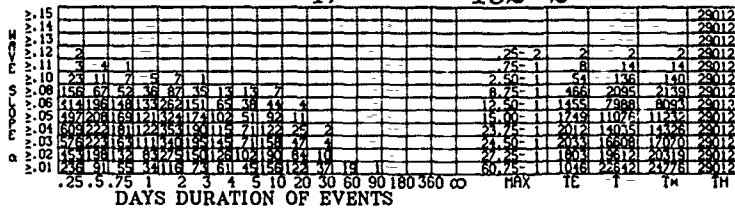
44 287-3



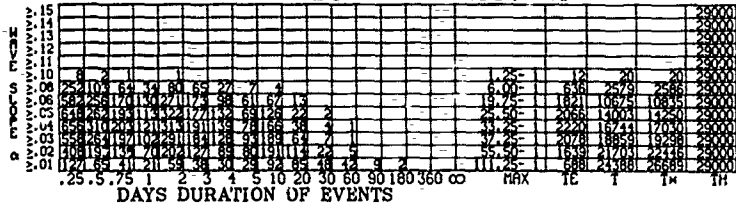
46 210-1



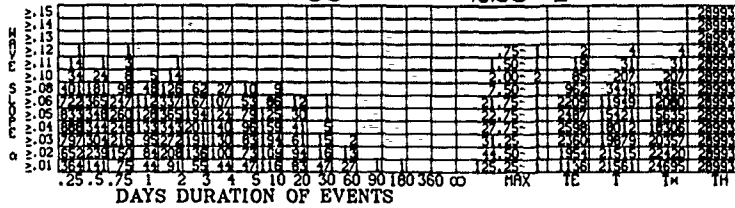
47 182-2



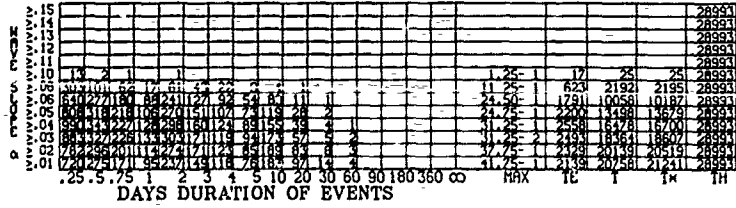
49 207-2



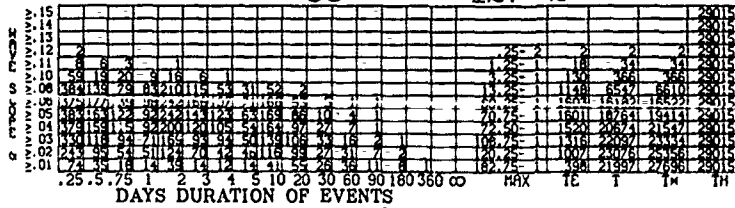
50 226-1



52 262-1

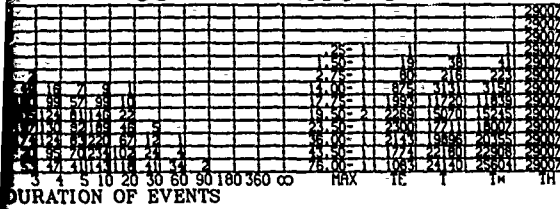


53 127-2

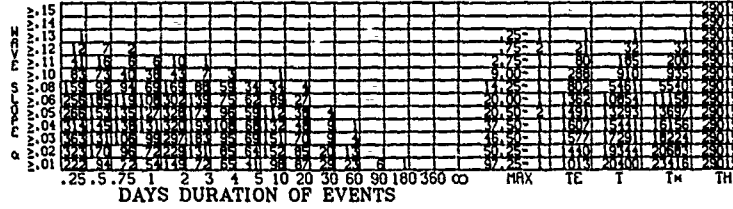


# ALL DAYS

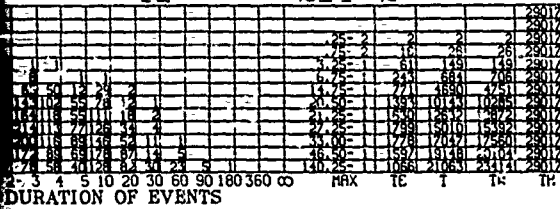
38 265-3



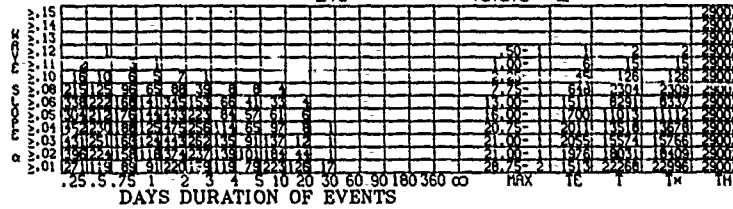
39 216-2



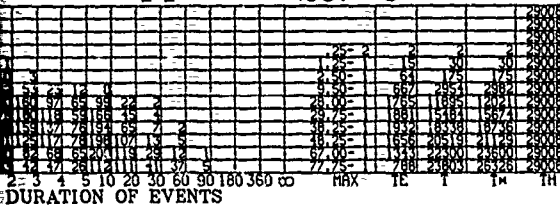
41 214-2



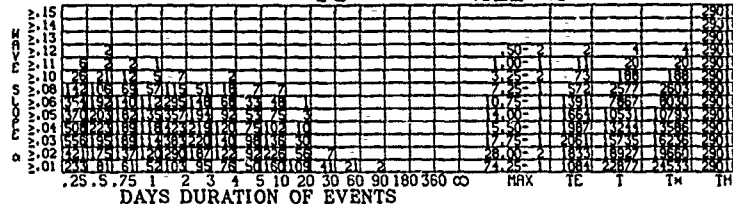
42 222-1



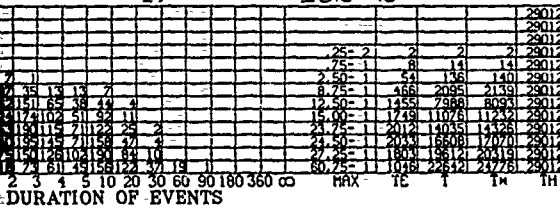
44 287-3



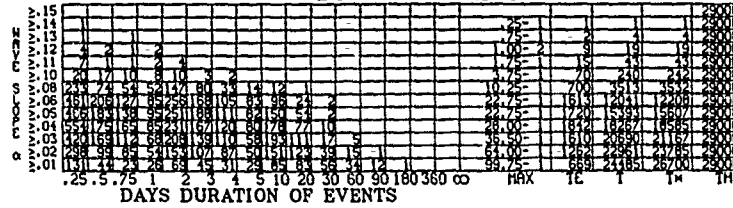
45 211-2



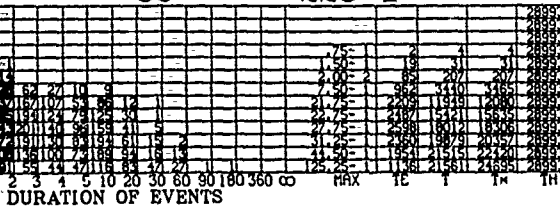
47 182-2



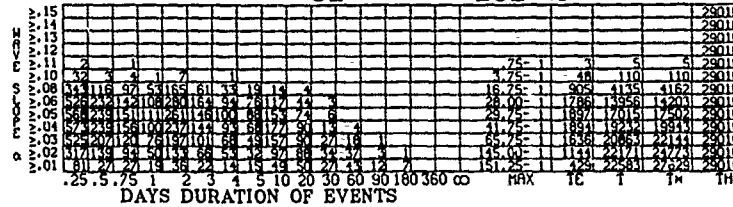
48 151-2



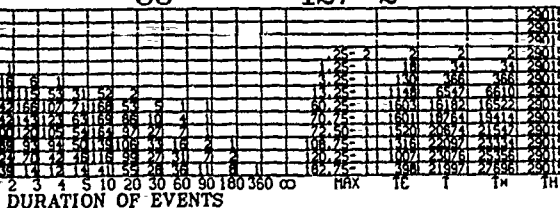
50 226-1



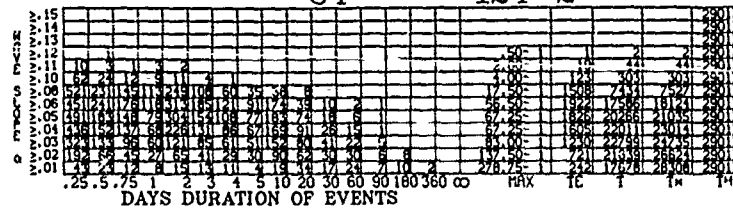
51 161-2



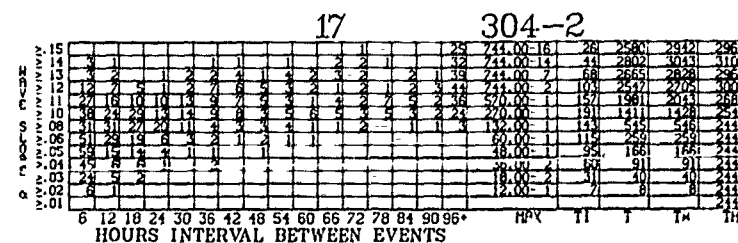
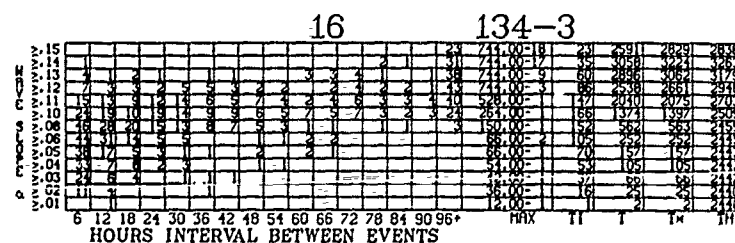
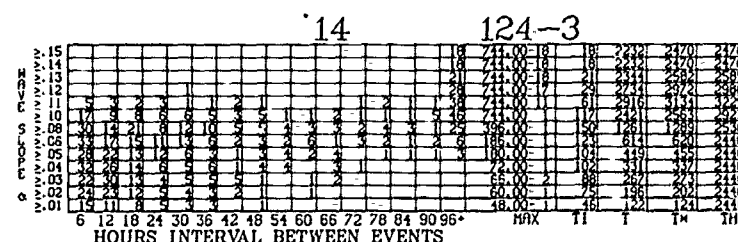
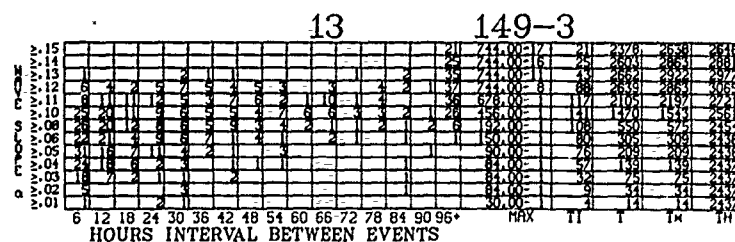
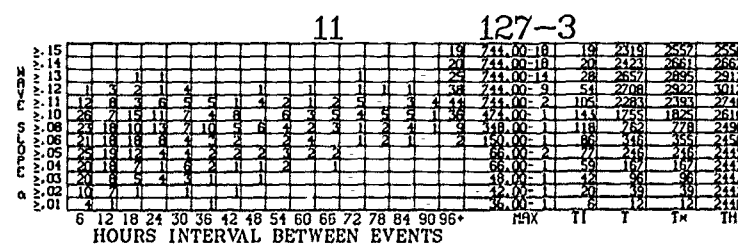
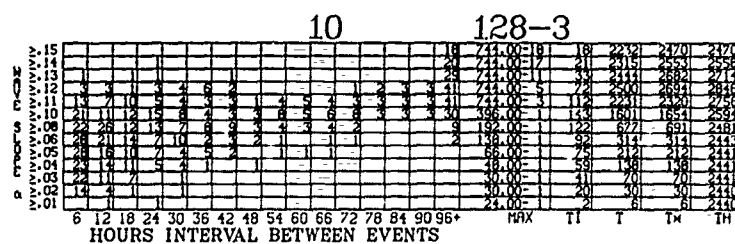
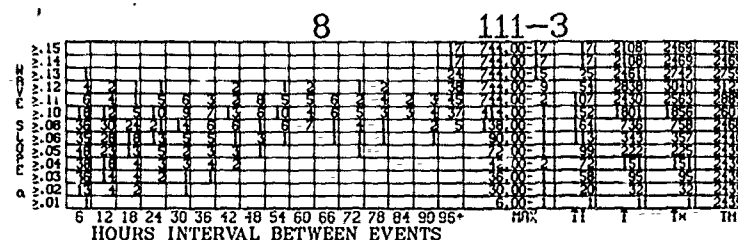
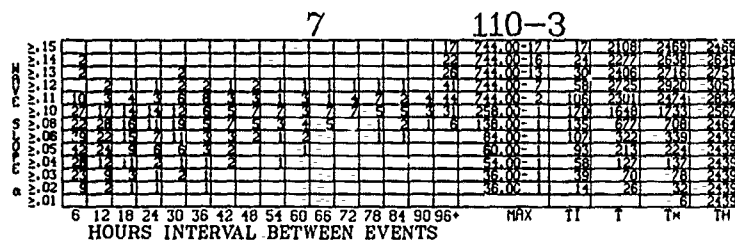
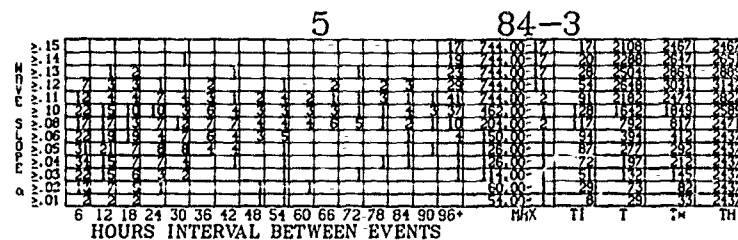
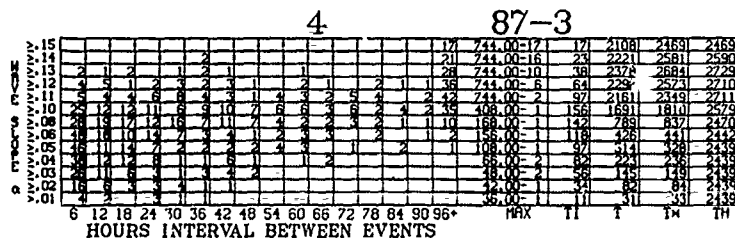
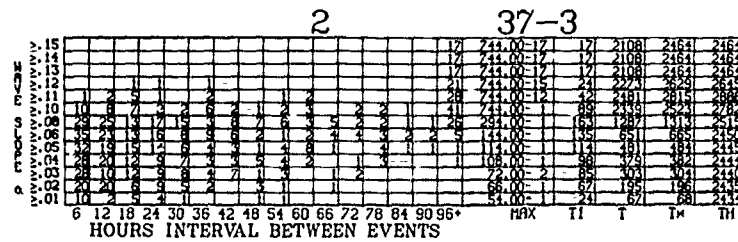
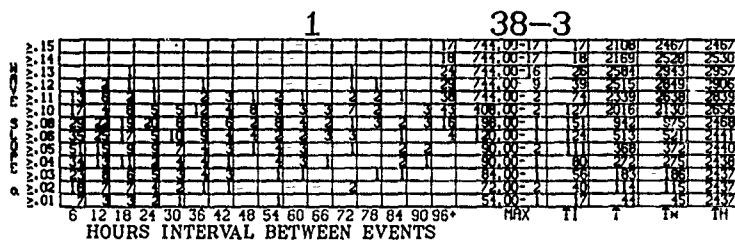
53 127-2



54 124-2

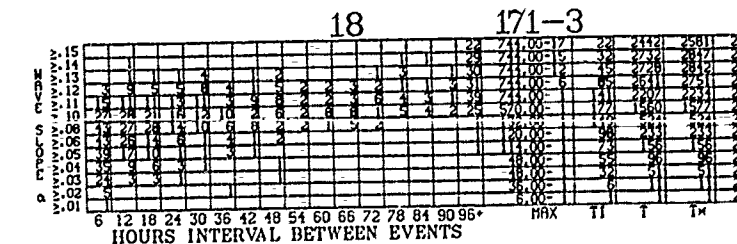
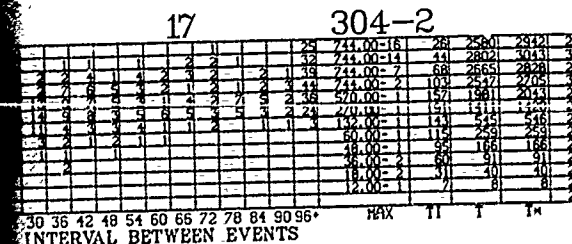
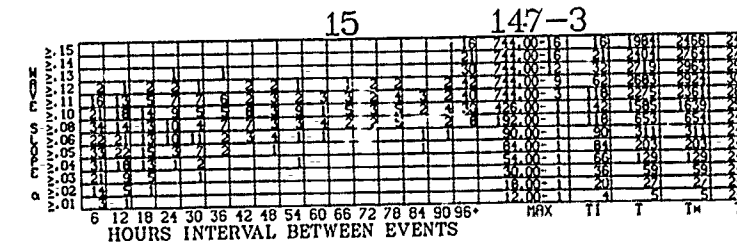
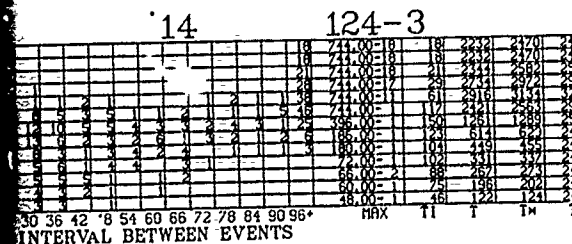
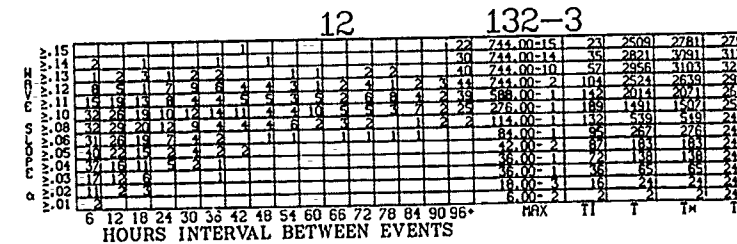
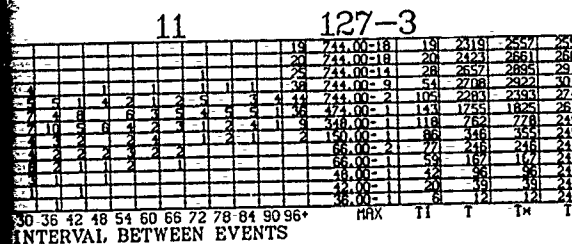
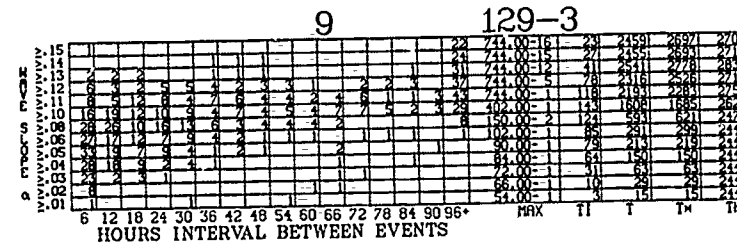
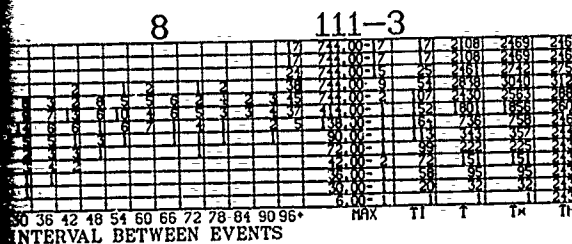
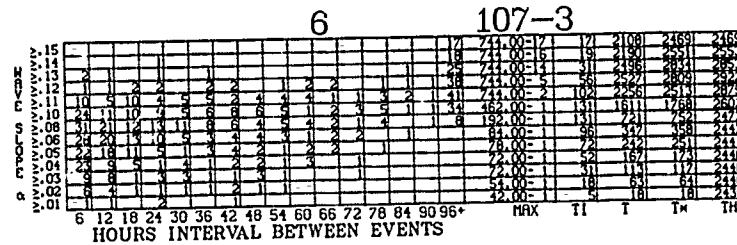
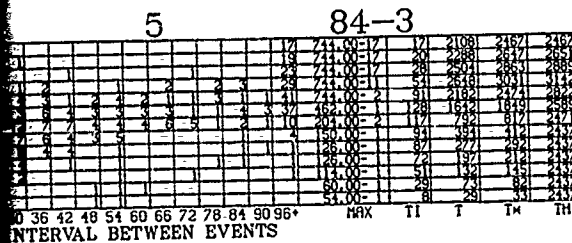
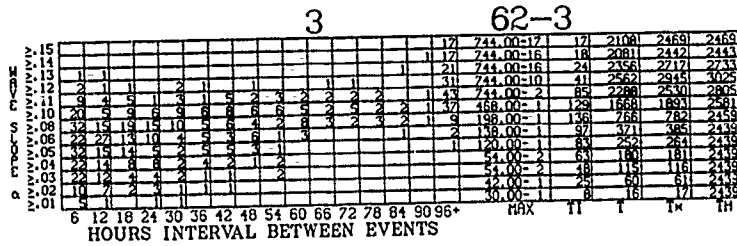
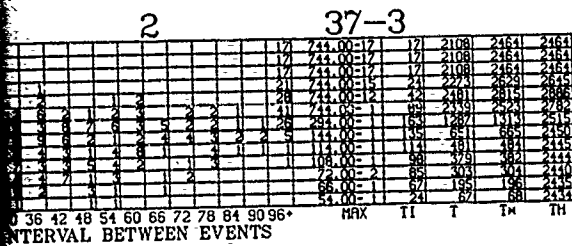


# JANUARY



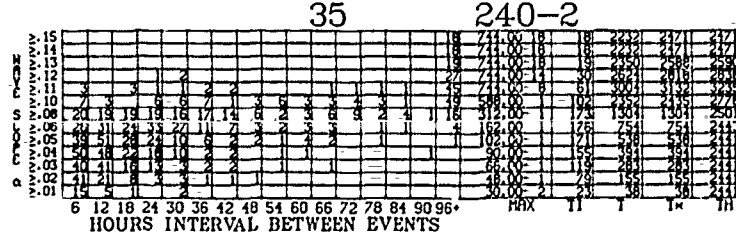
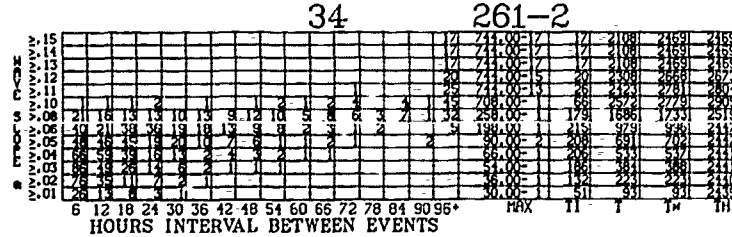
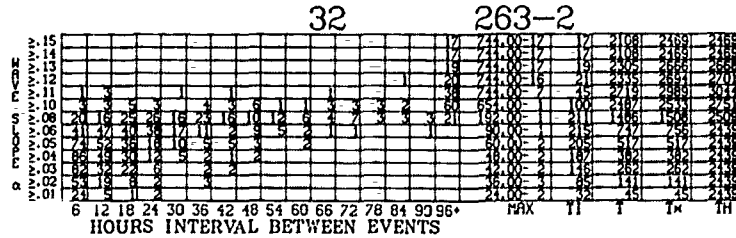
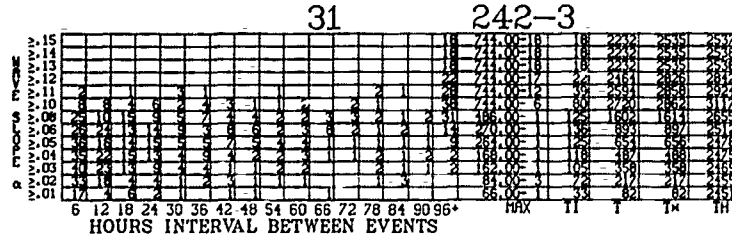
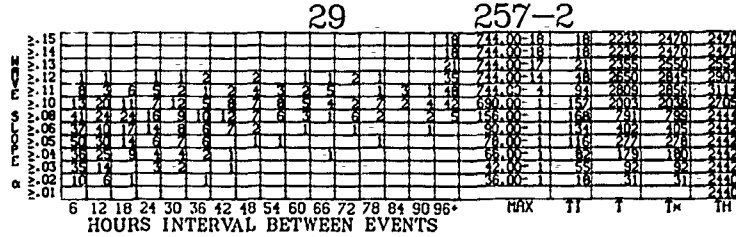
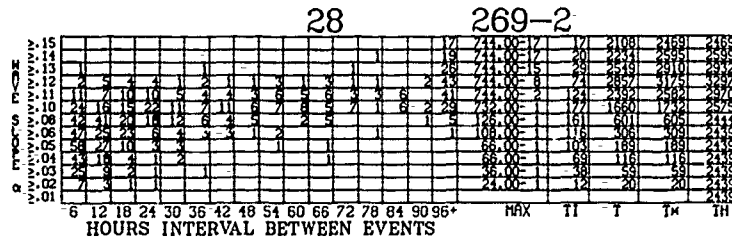
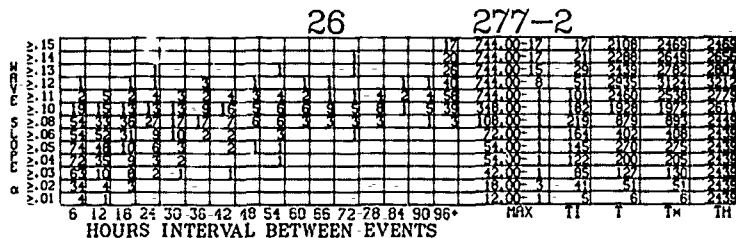
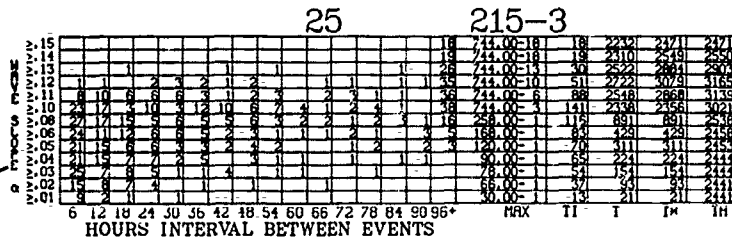
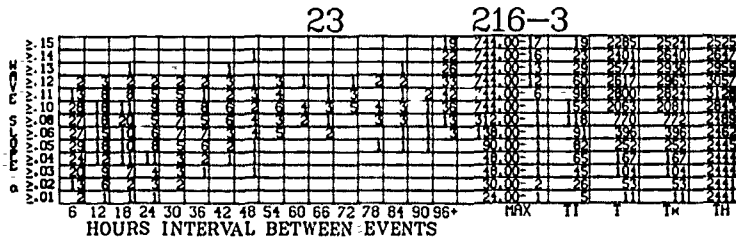
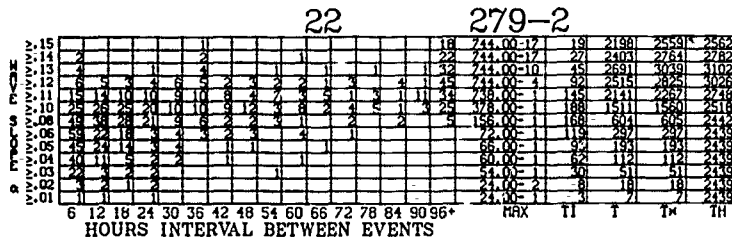
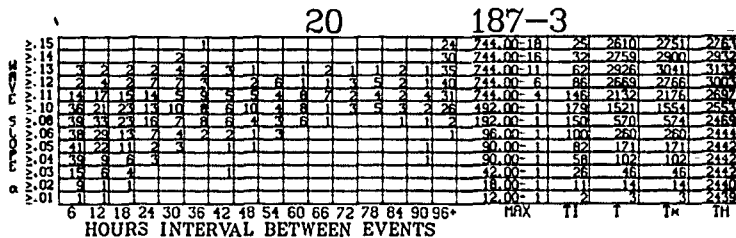
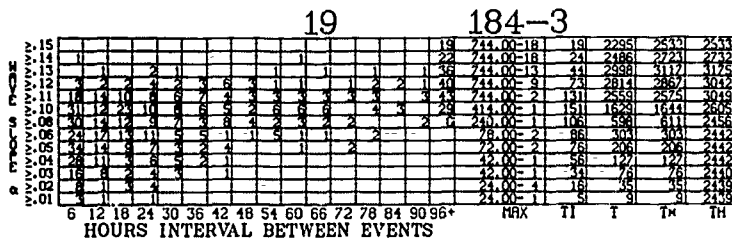


# WAVE SLOPE ( $\alpha$ ) INTERVALS

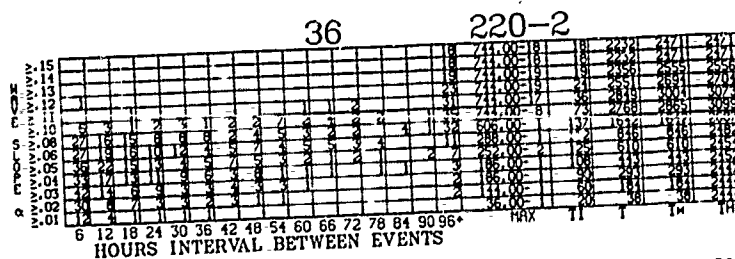
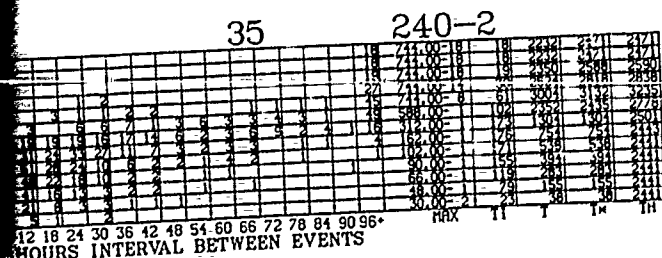
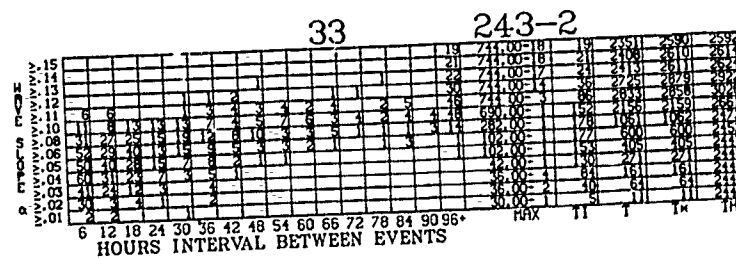
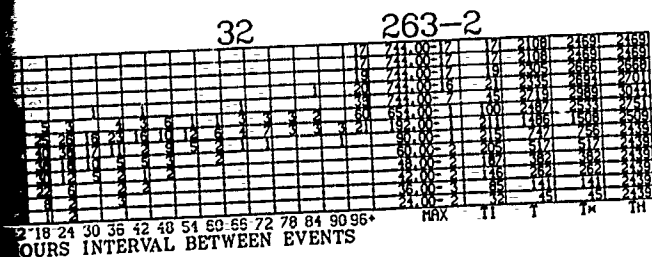
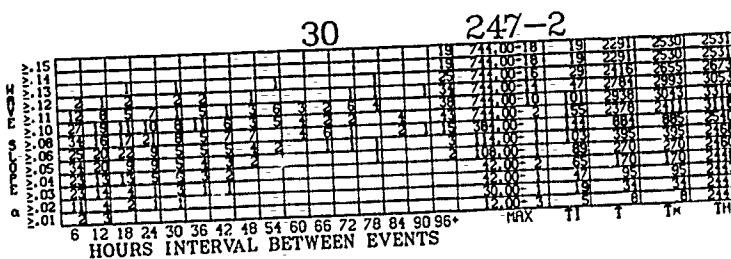
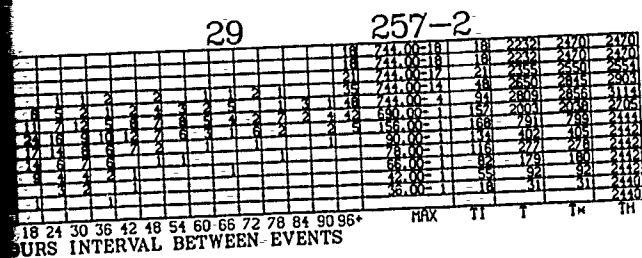
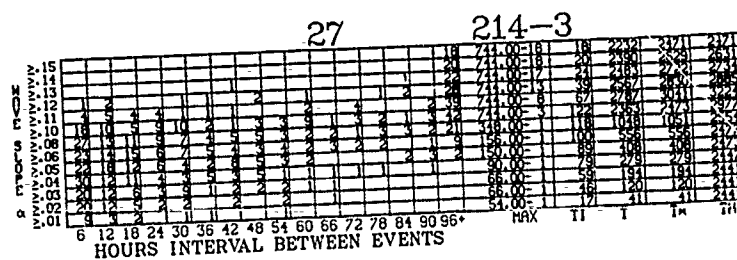
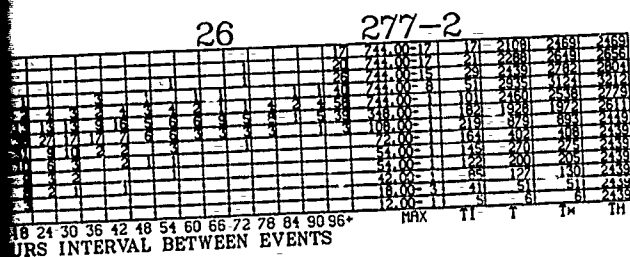
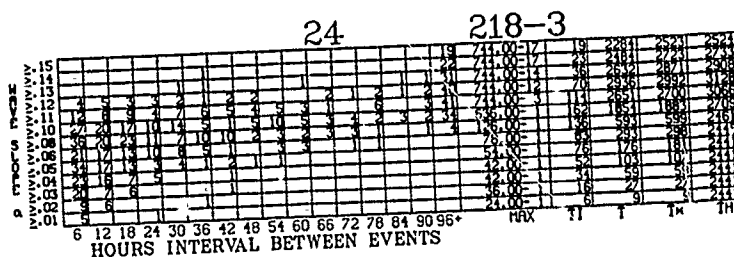
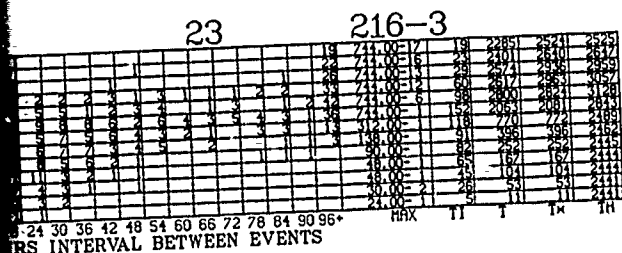
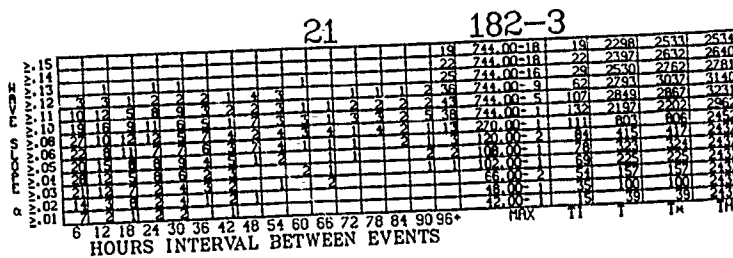
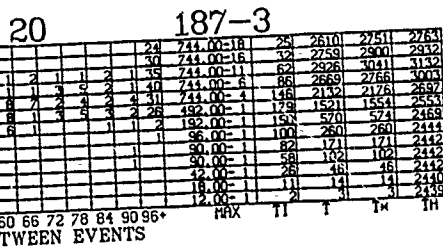




# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)



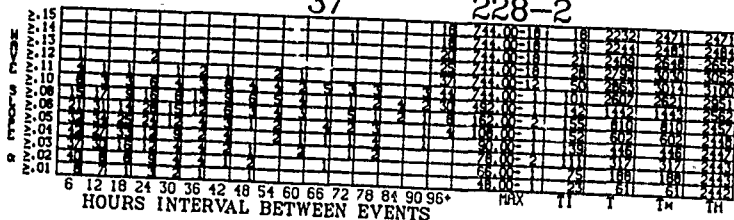
# JANUARY



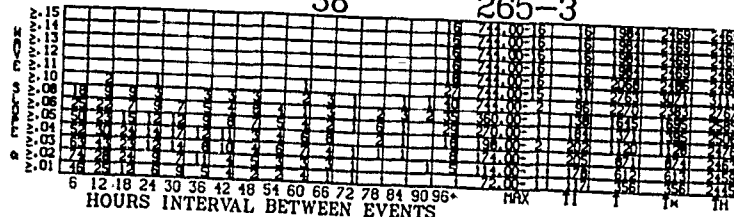
# JANUARY

# WAVE S

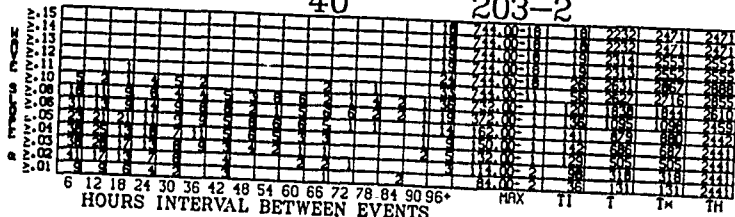
37 228-2



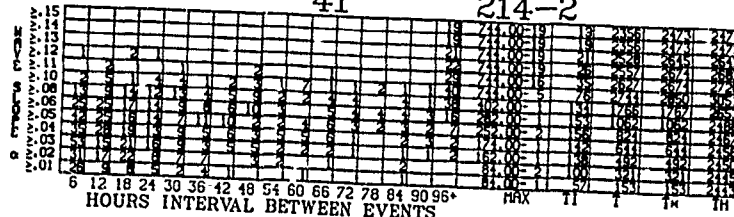
38 265-3



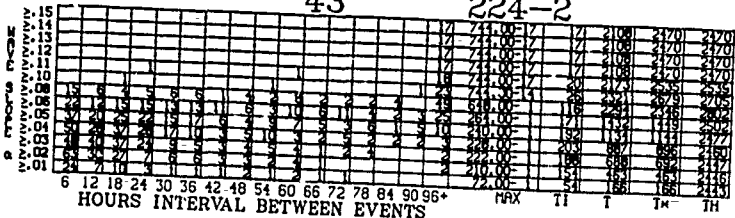
40 203-2



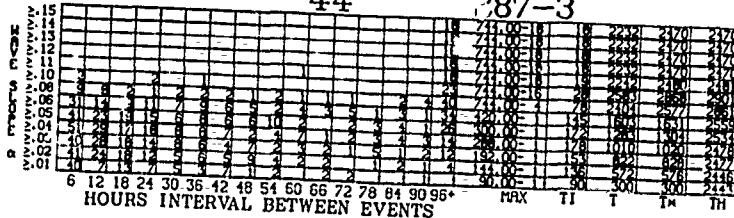
41 214-2



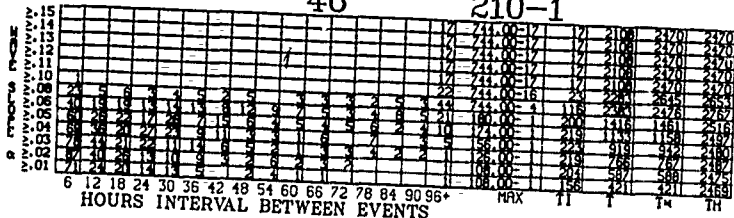
43 224-2



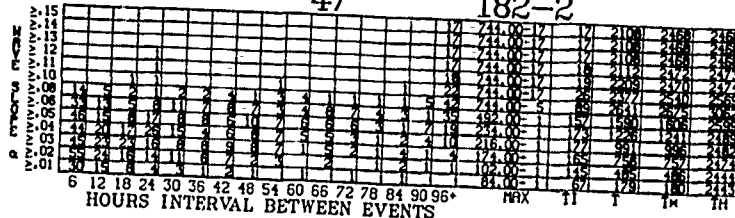
44 287-3



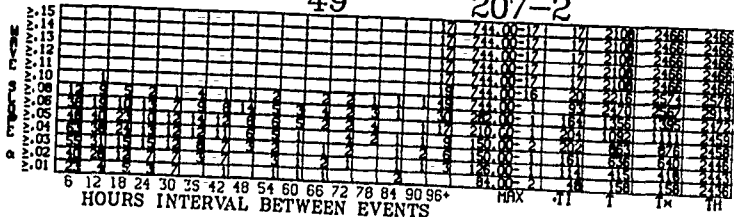
46 210-1



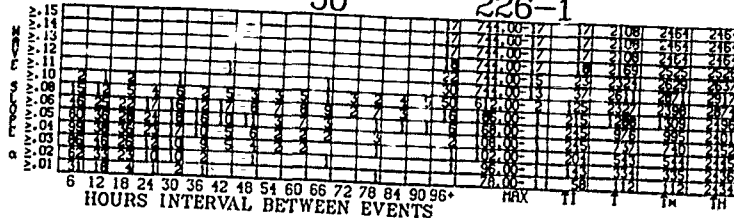
47 182-2



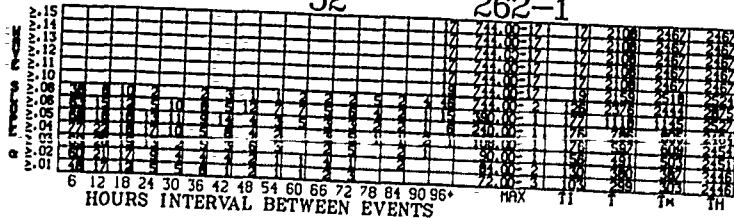
49 207-2



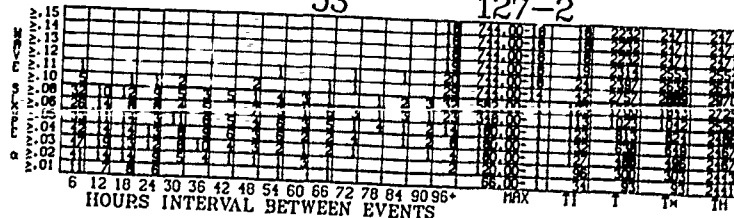
50 226-1



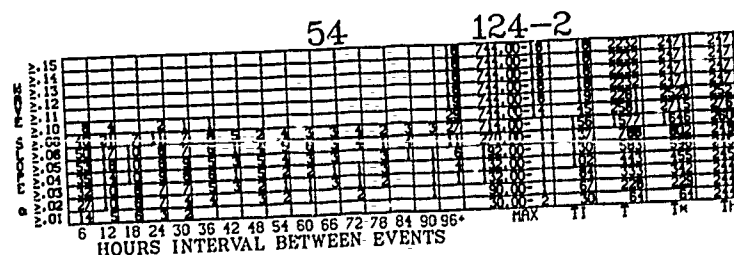
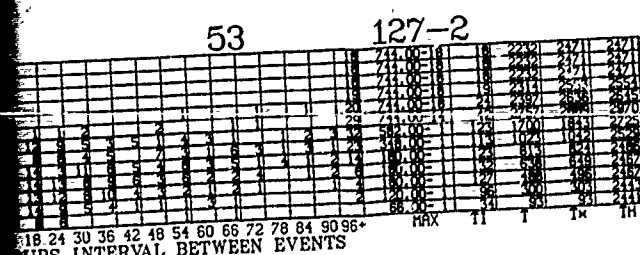
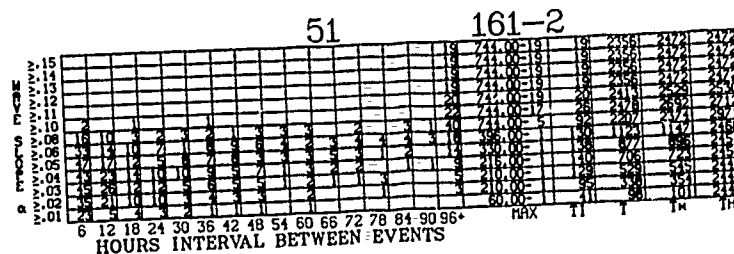
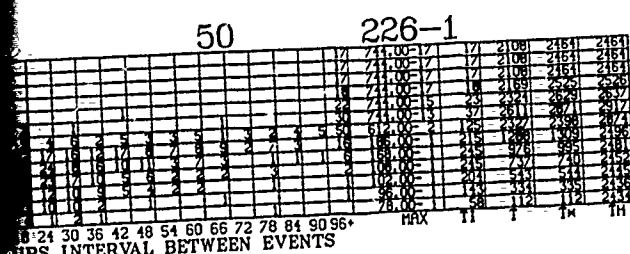
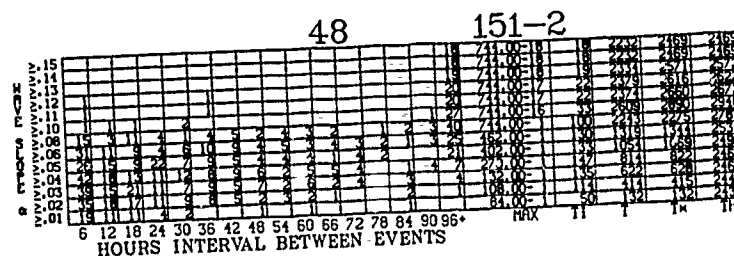
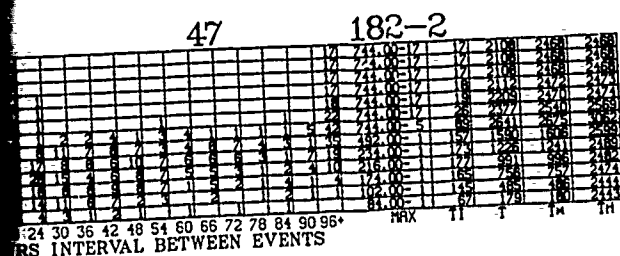
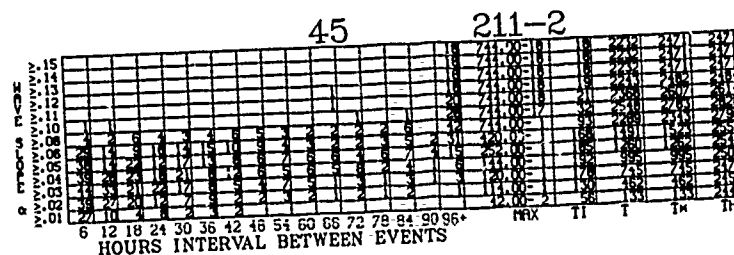
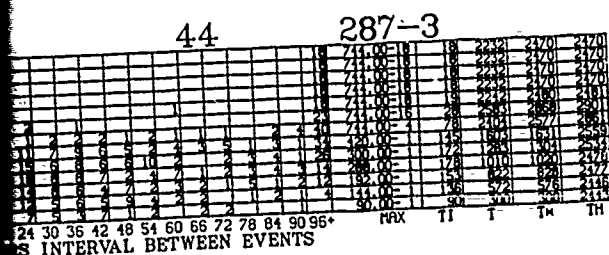
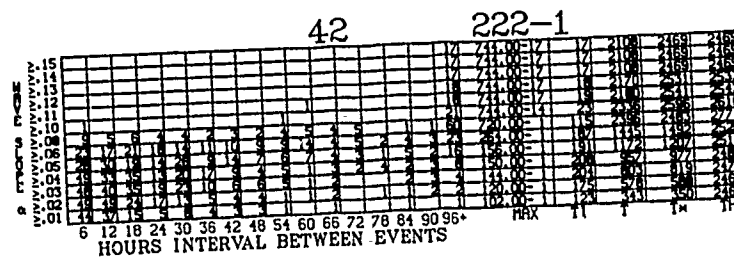
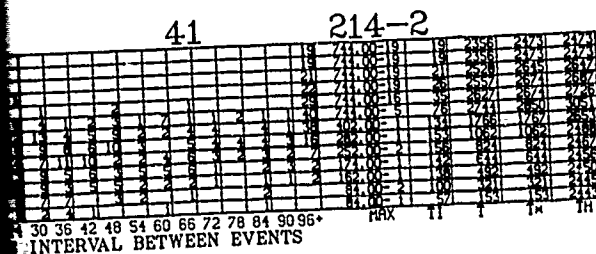
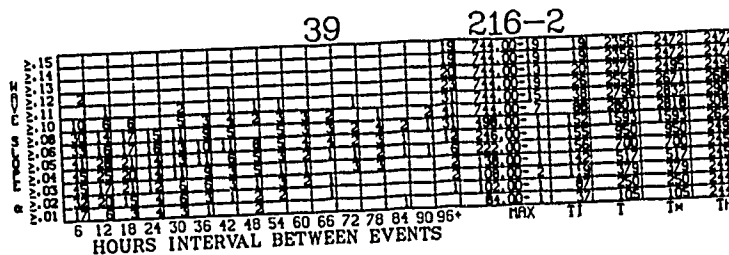
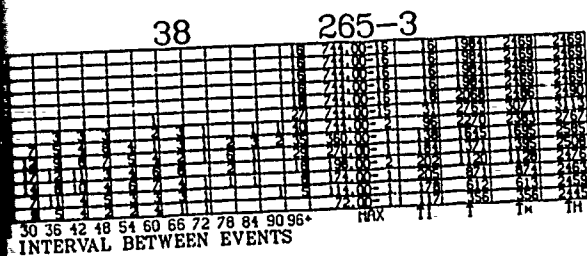
52 262-1



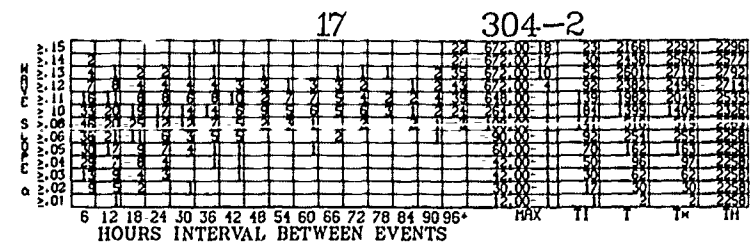
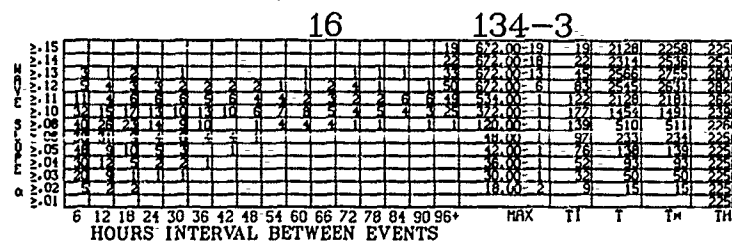
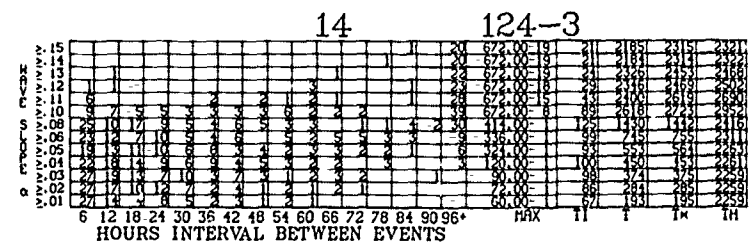
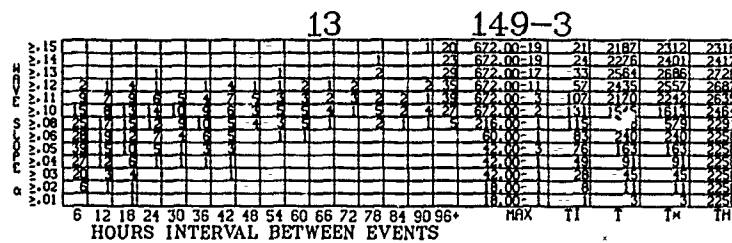
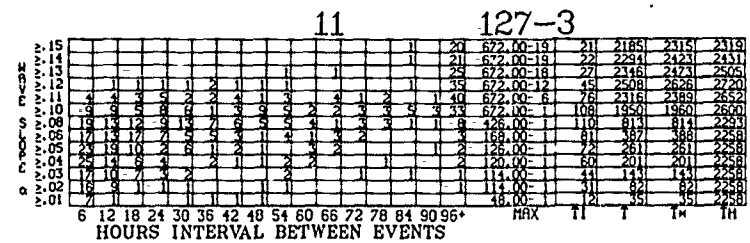
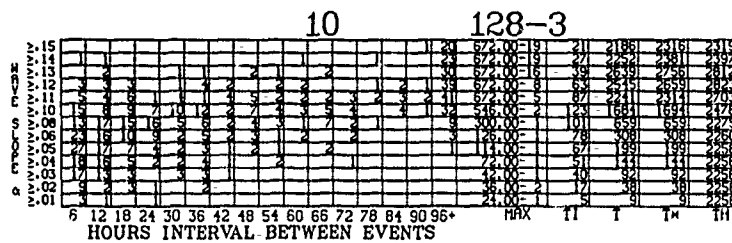
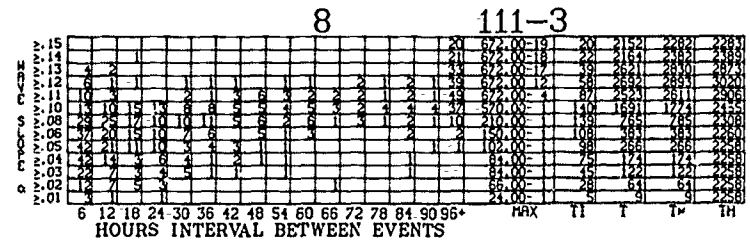
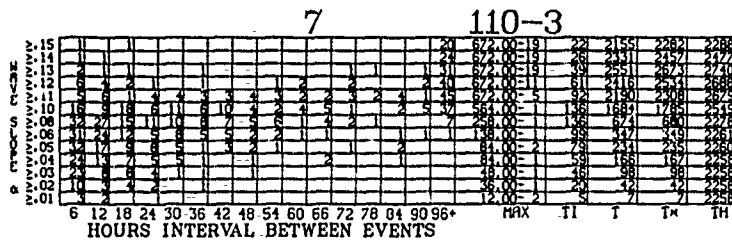
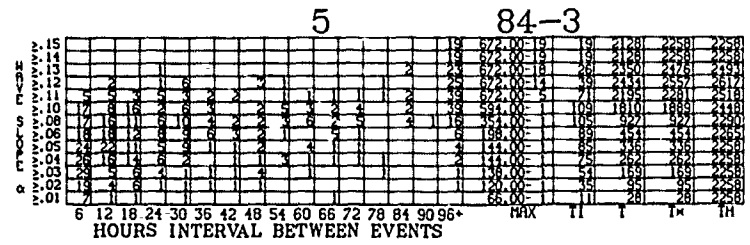
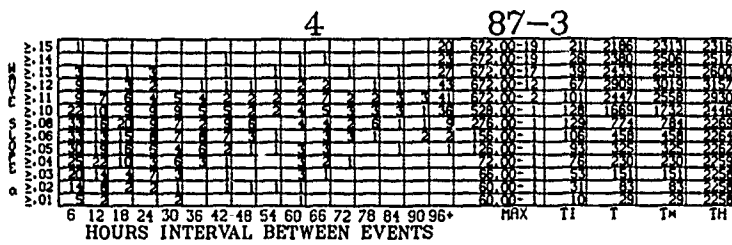
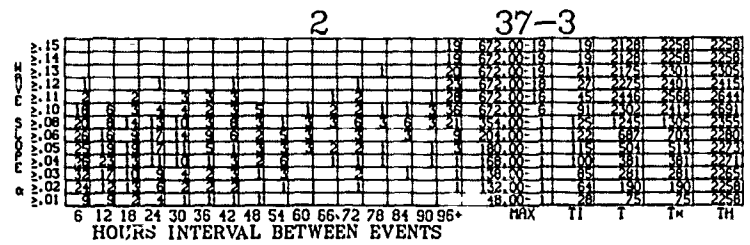
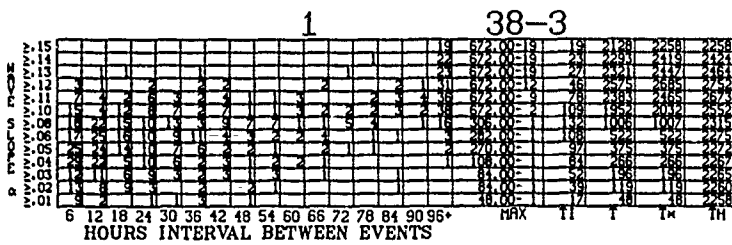
53 127-2



# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

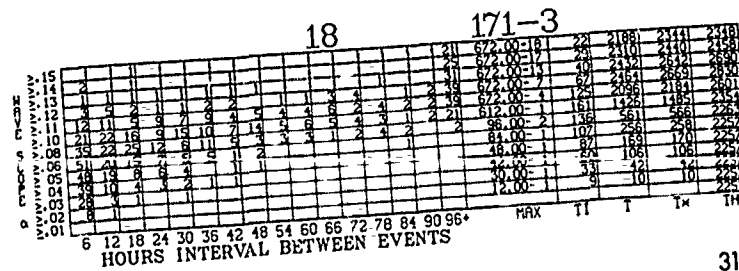
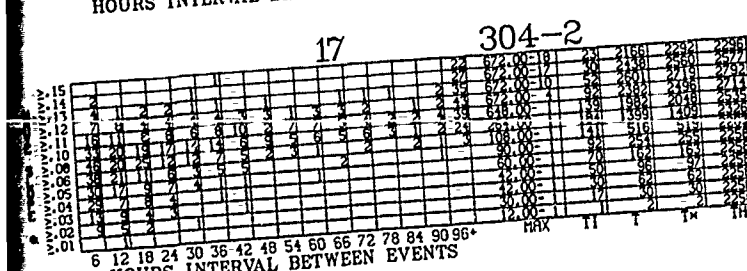
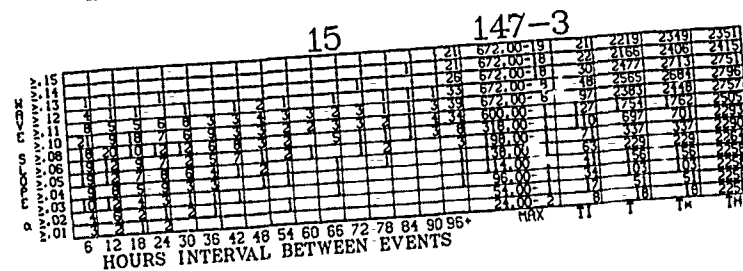
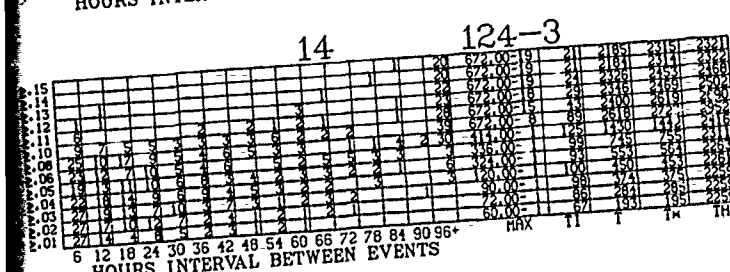
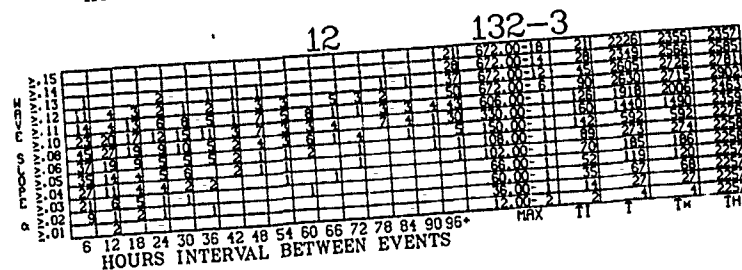
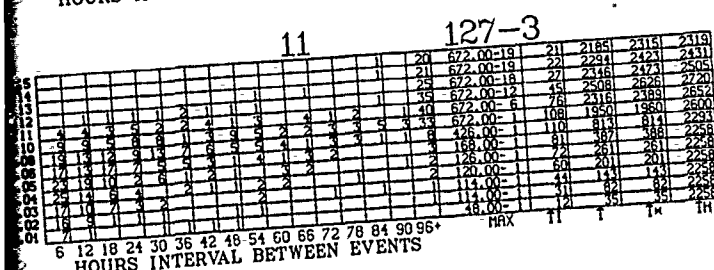
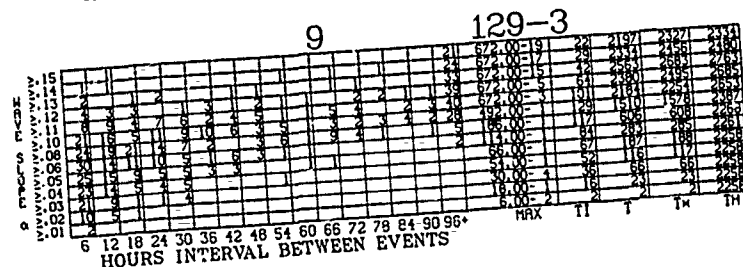
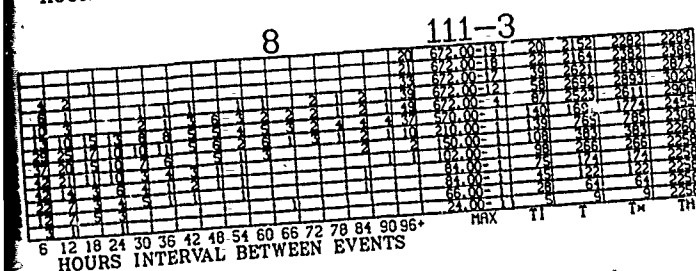
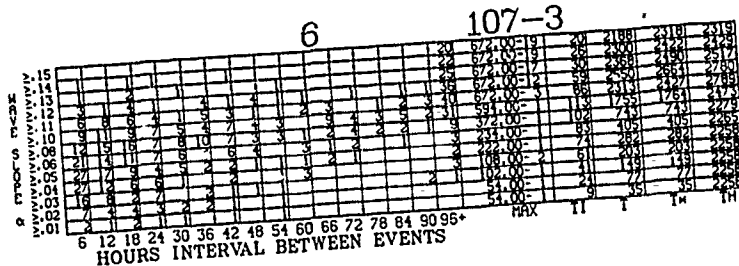
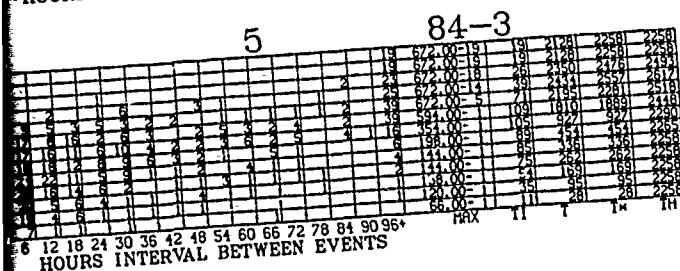
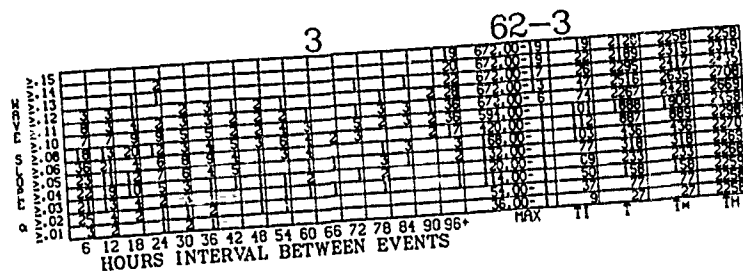
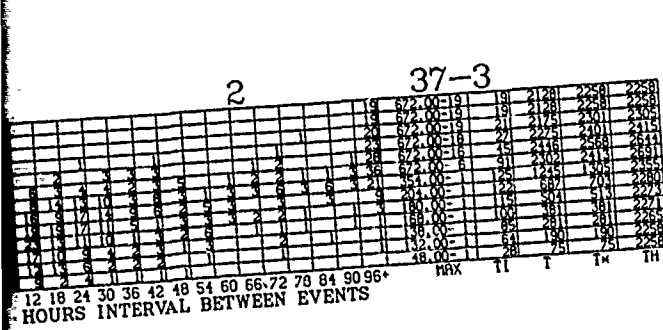


# WAVE SLOPE ( $\alpha$ ) INTERVALS





# FEBRUARY

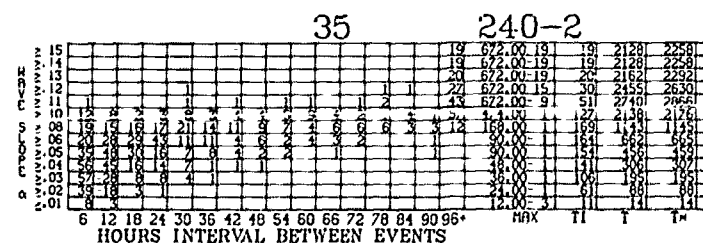
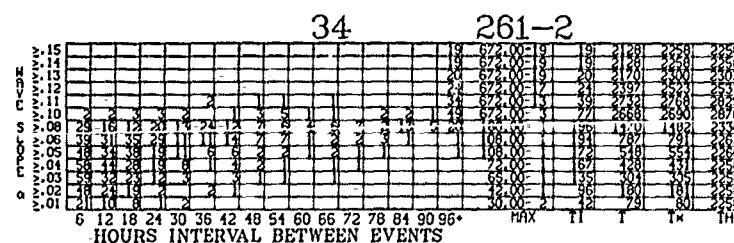
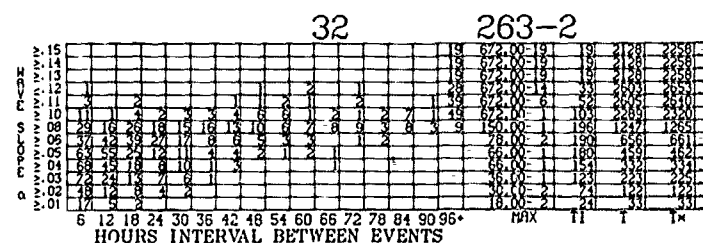
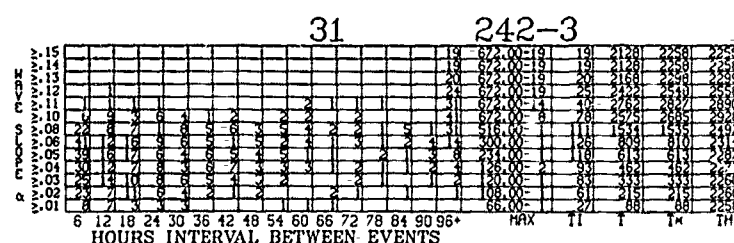
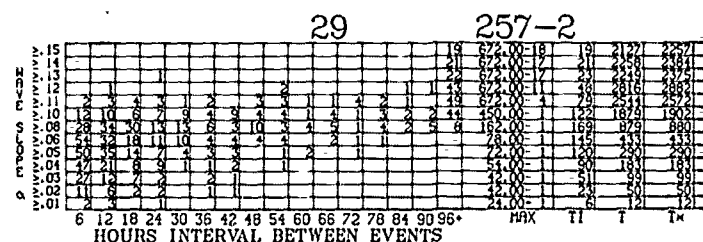
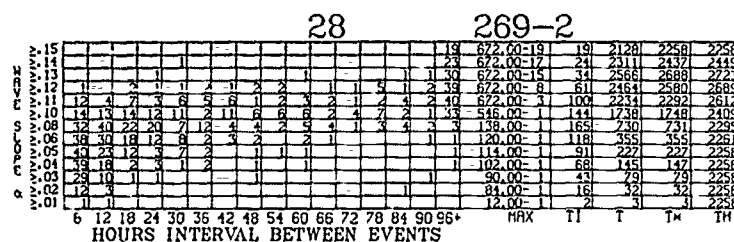
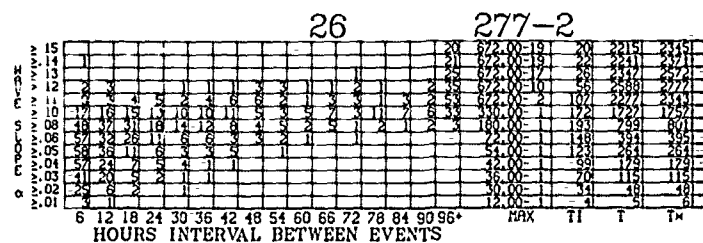
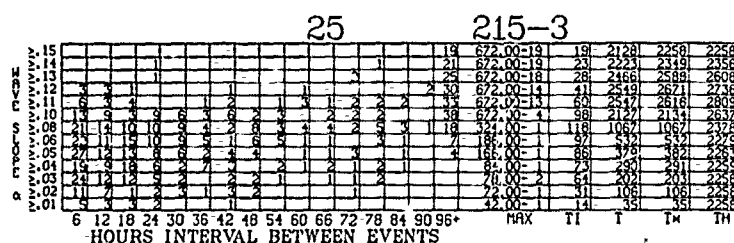
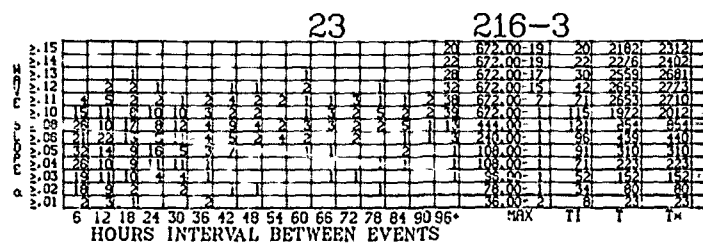
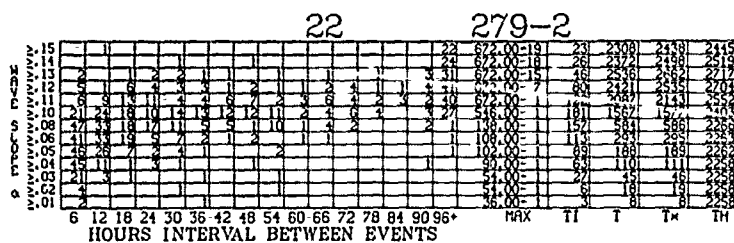
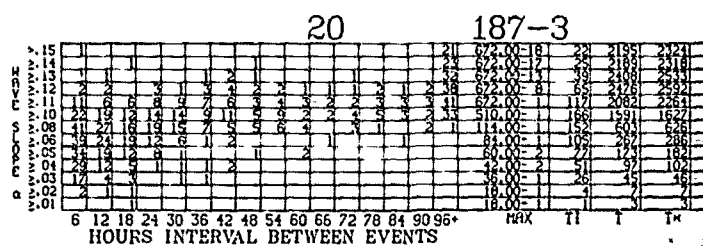
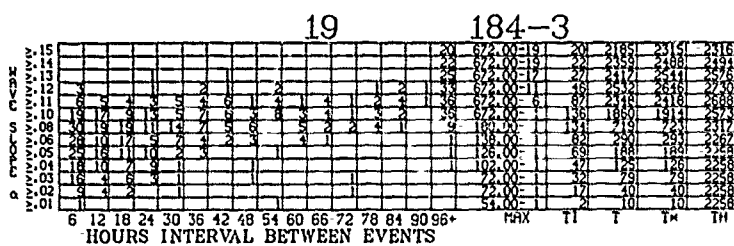


(2)



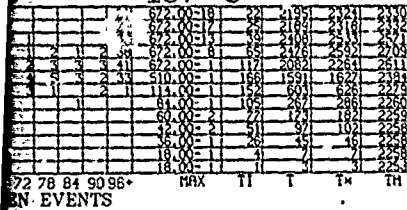
# FEBRUARY

# WAVE



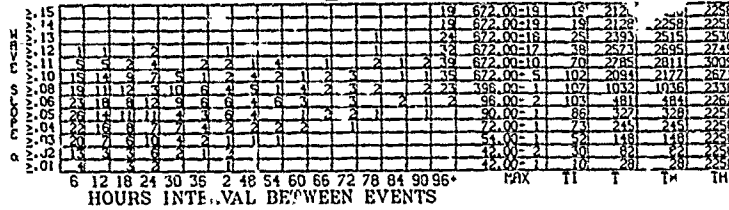
# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

187-3

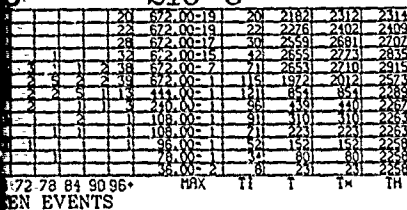


21

182-3

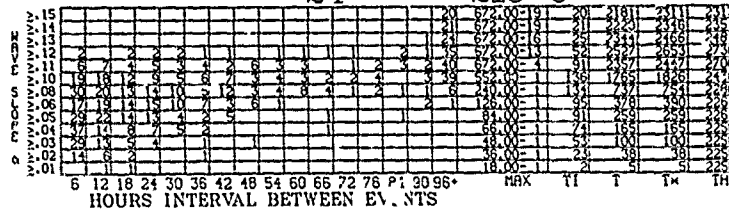


216-3

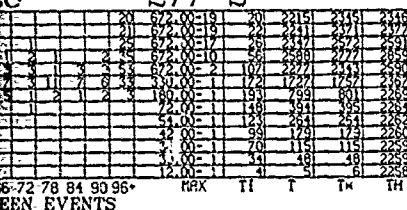


24

218-3

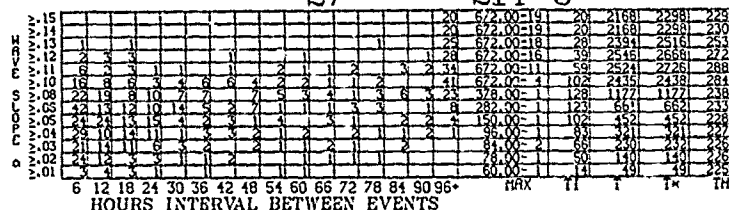


277-2

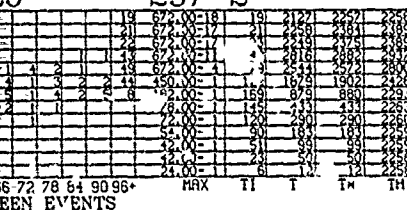


27

214-3

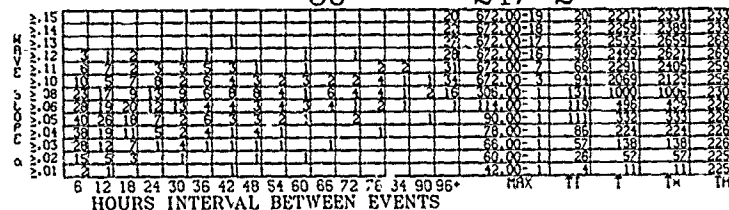


257-2

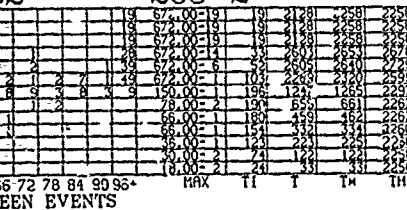


30

247-2

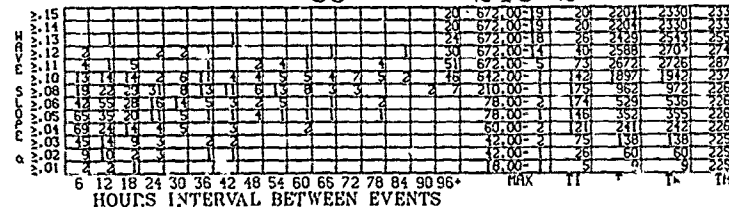


263-2

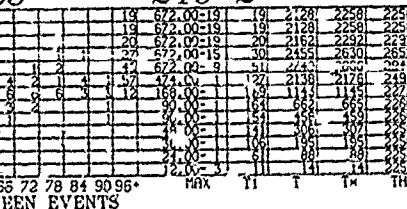


33

243-2

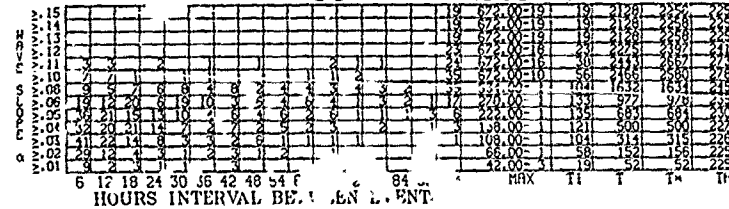


240-2

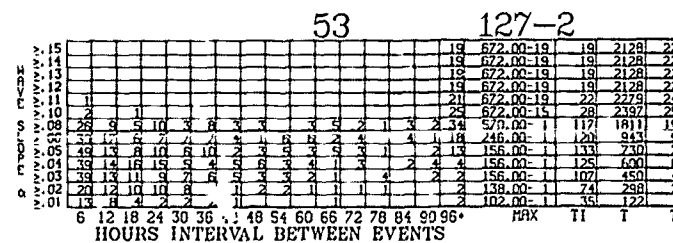
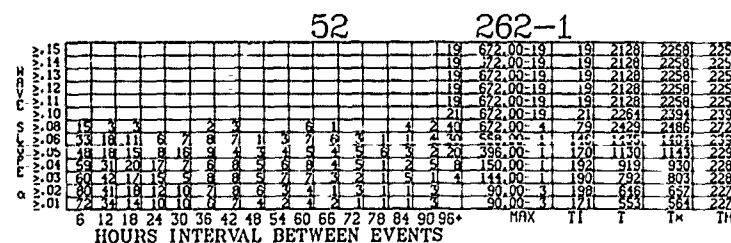
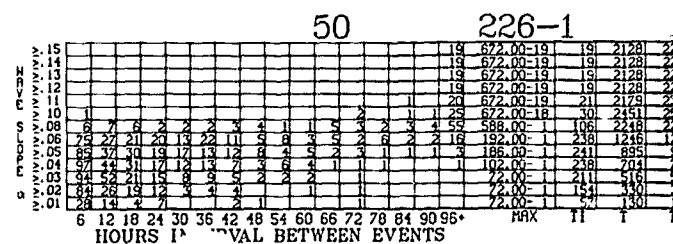
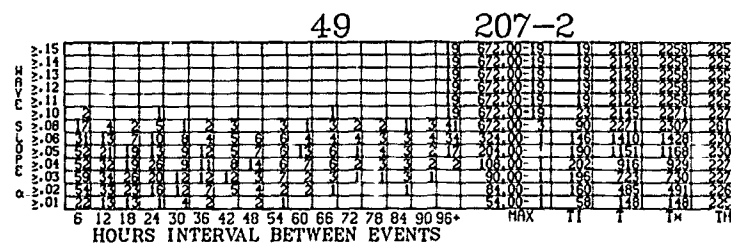
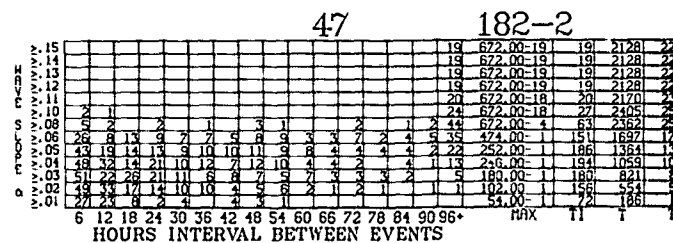
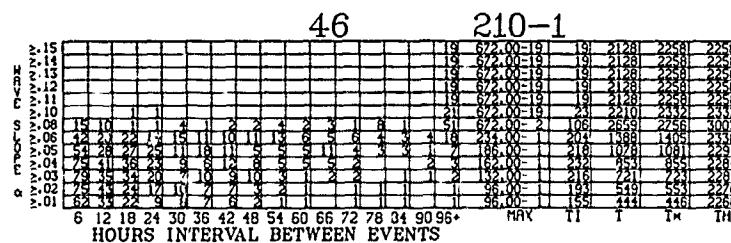
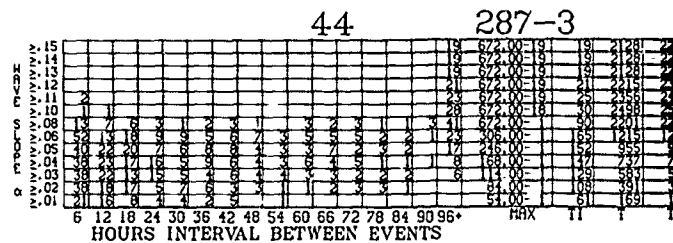
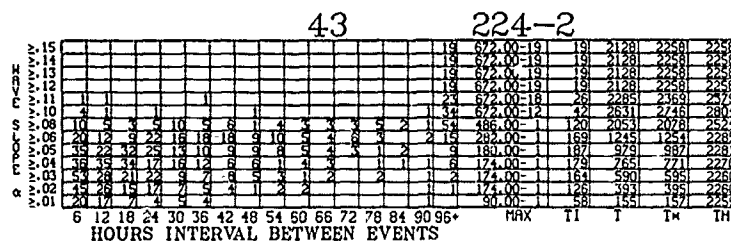
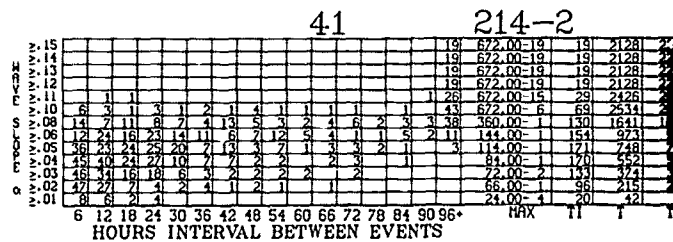
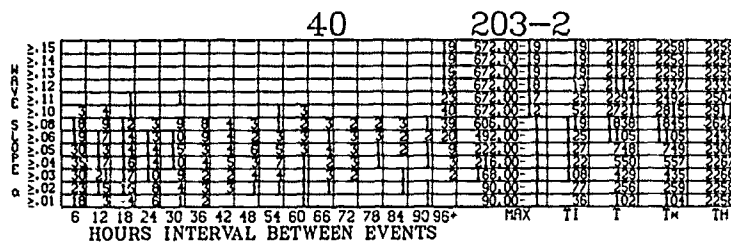
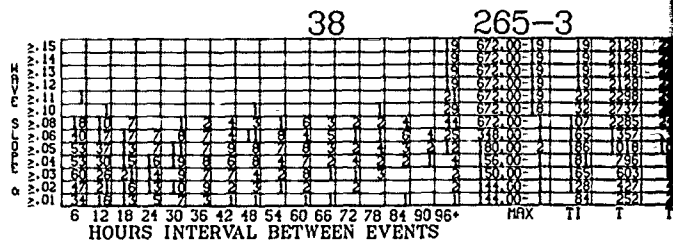
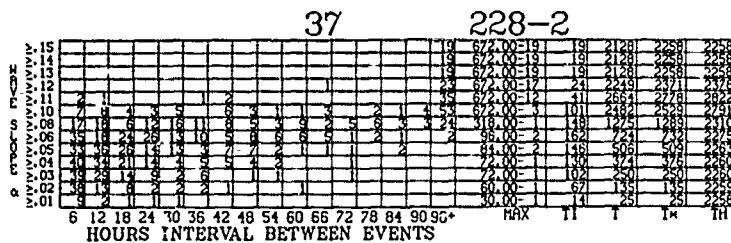


36

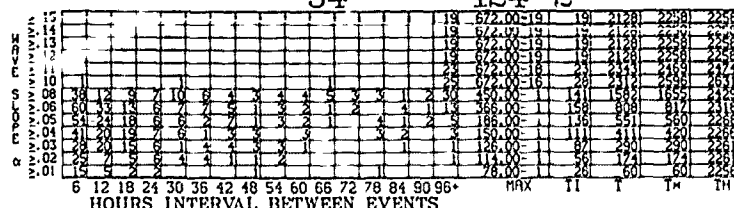
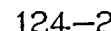
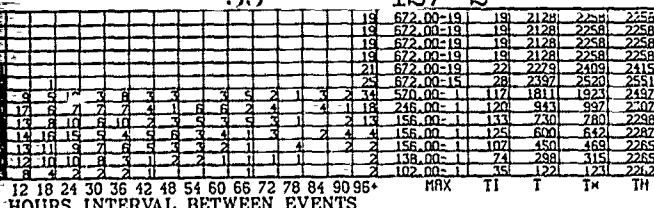
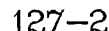
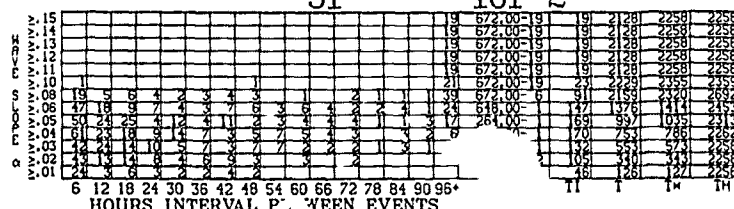
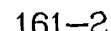
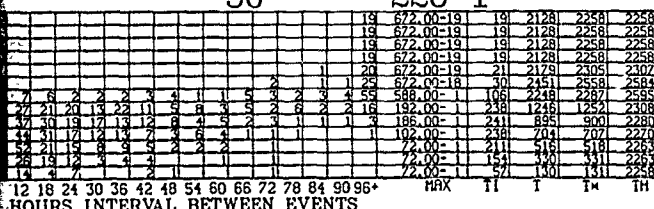
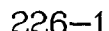
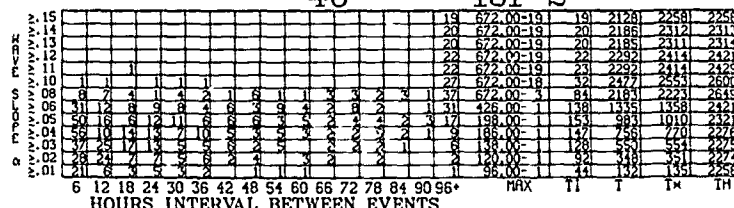
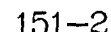
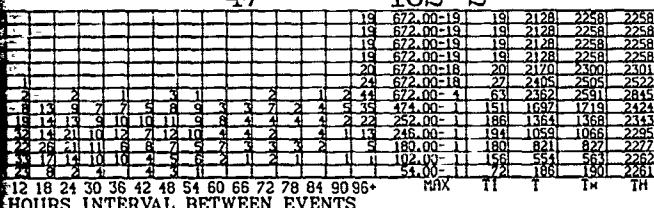
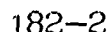
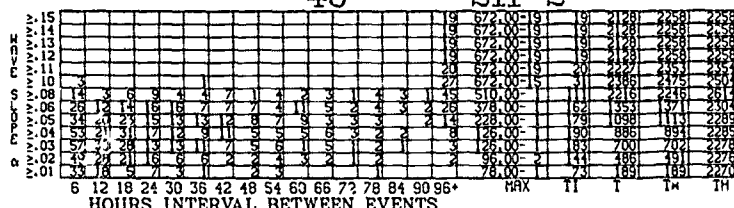
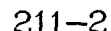
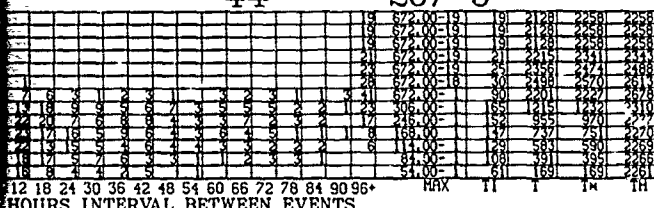
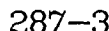
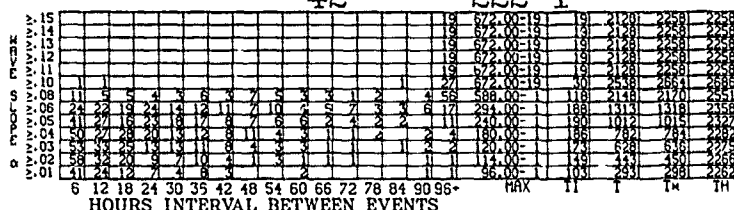
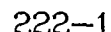
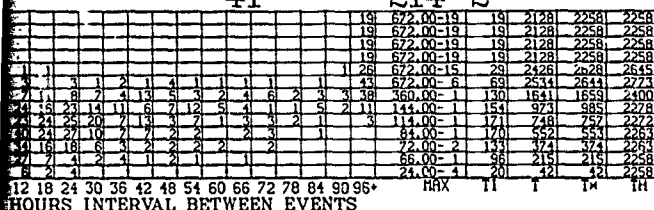
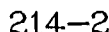
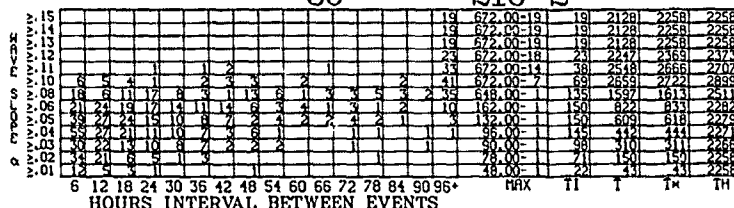
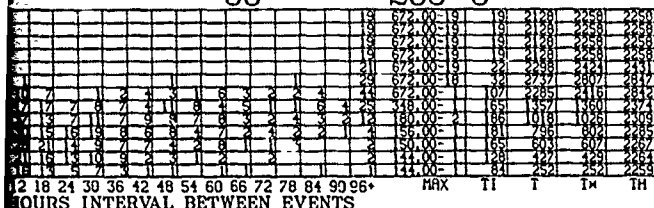
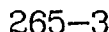
220-2



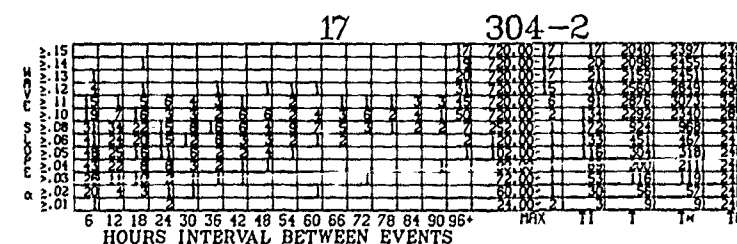
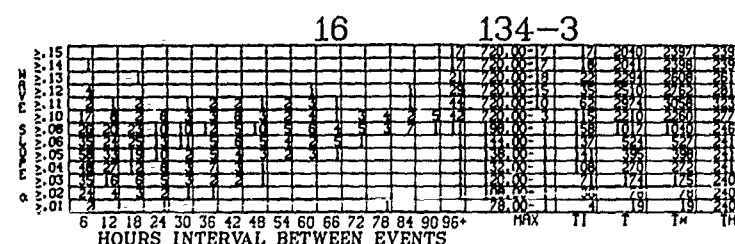
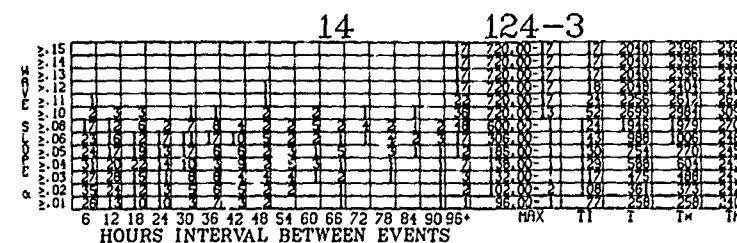
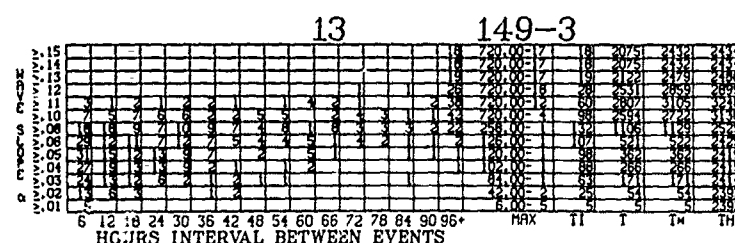
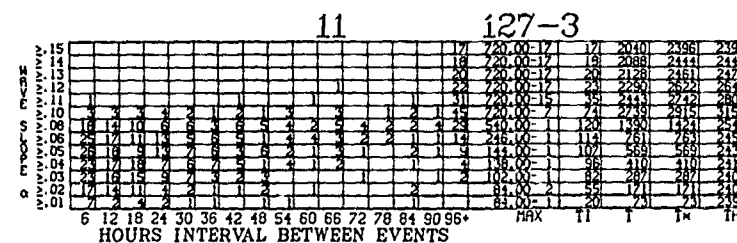
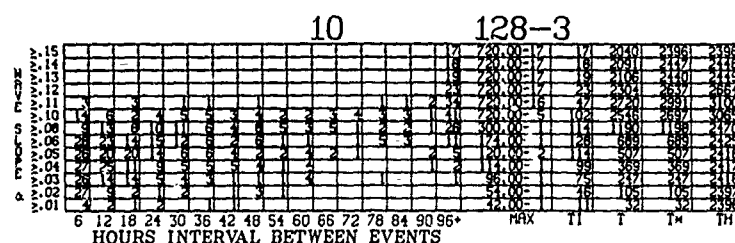
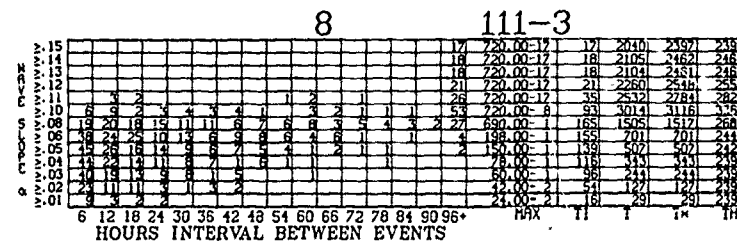
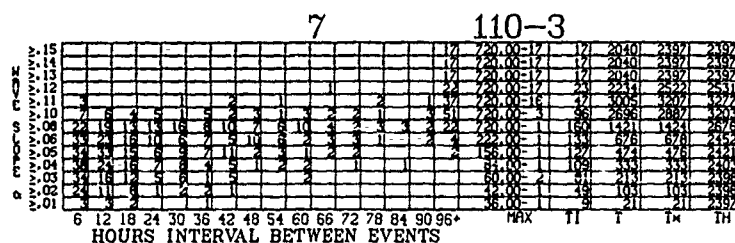
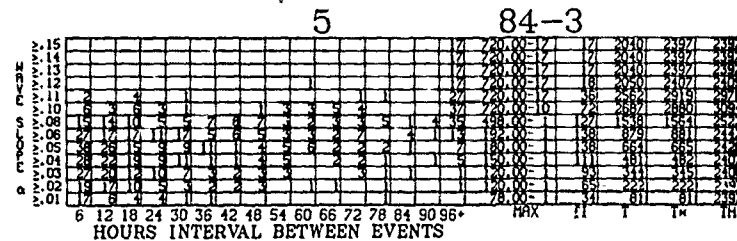
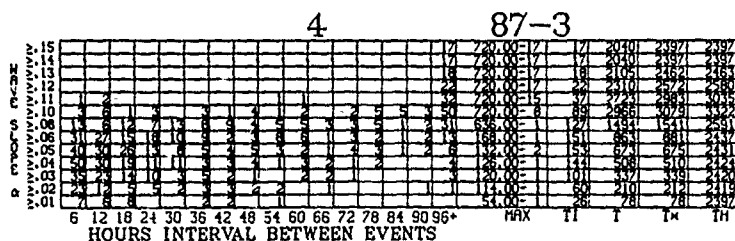
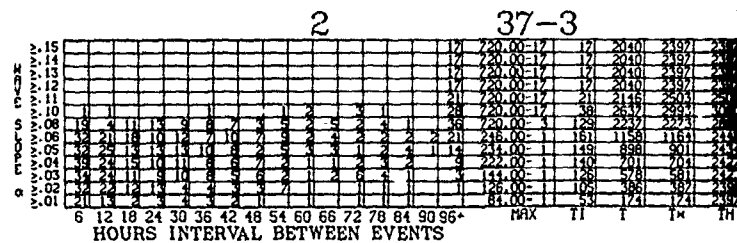
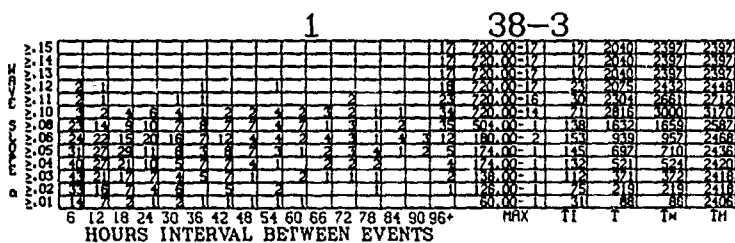
# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)



FEBRUARY



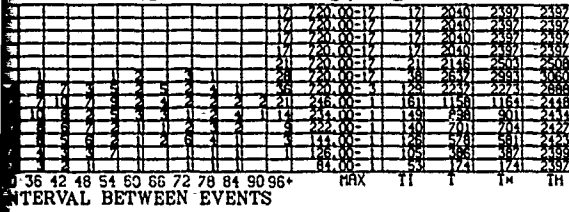
# APRIL



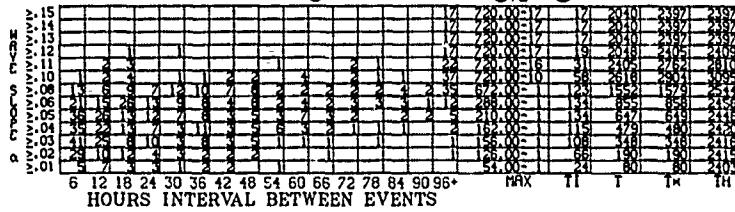


# WAVE SLOPE ( $\alpha$ ) INTERVALS

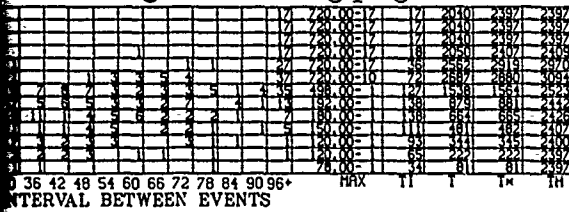
2 37-3



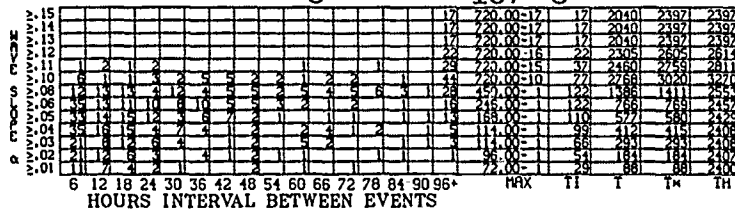
3 62-3



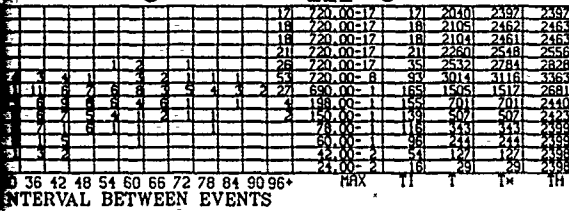
5 84-3



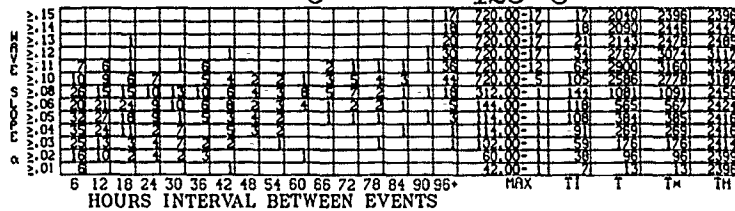
6 107-3



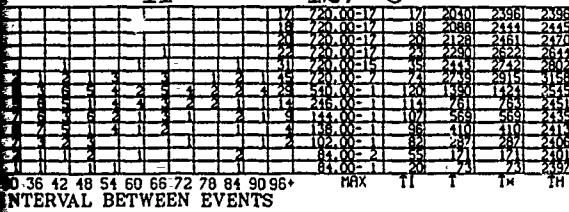
8 111-3



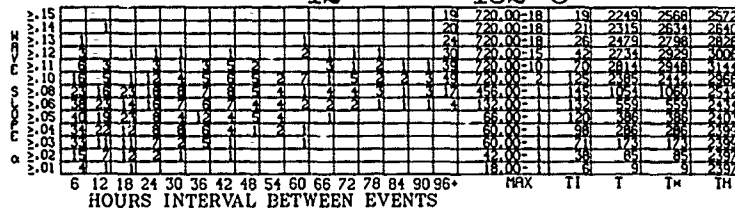
9 129-3



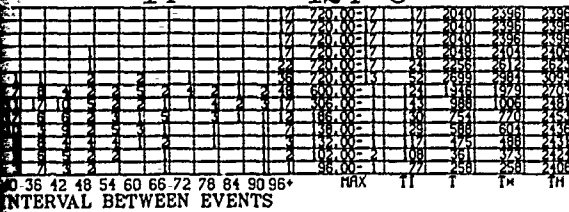
11 127-3



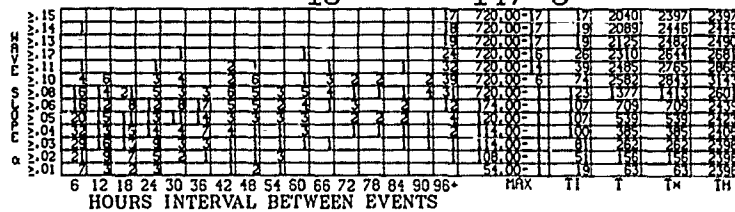
12 132-3



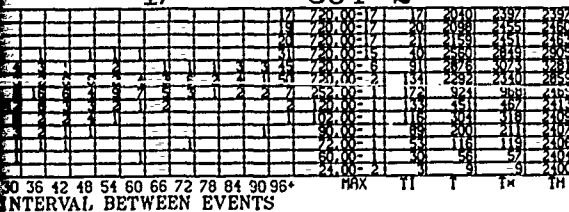
14 124-3



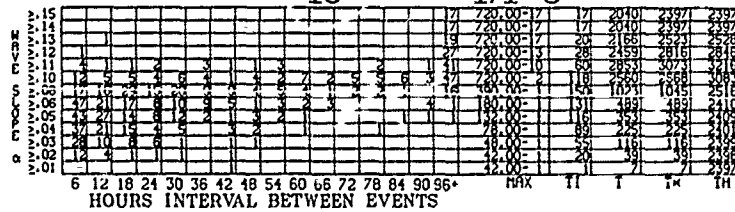
15 147-3



17 304-2

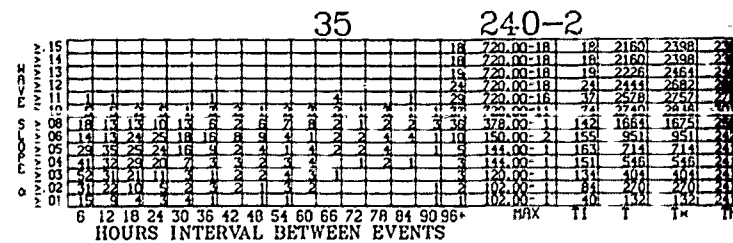
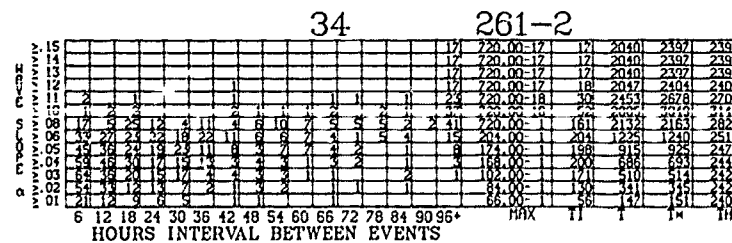
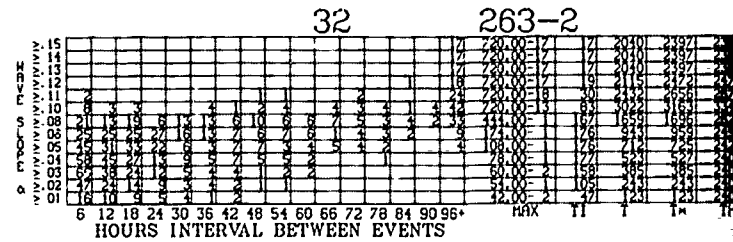
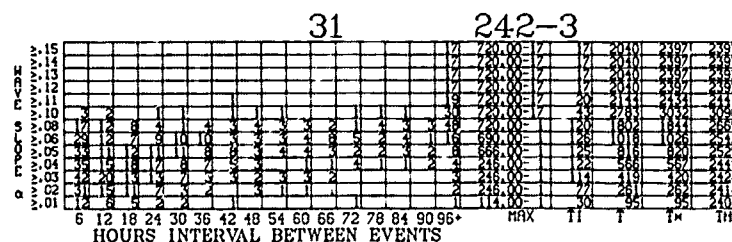
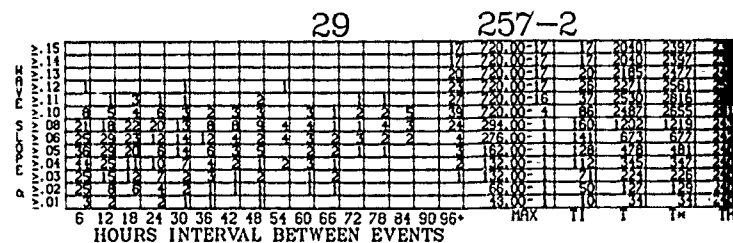
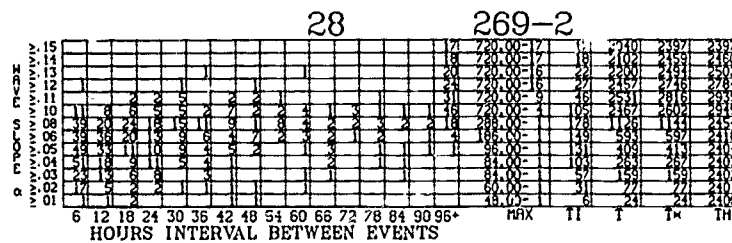
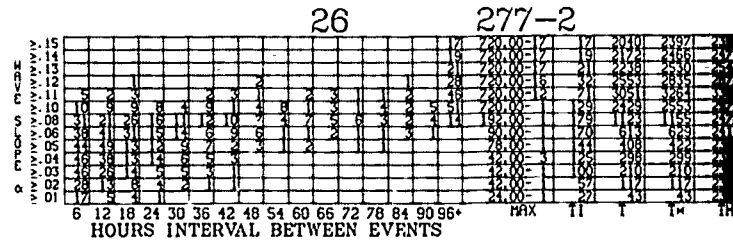
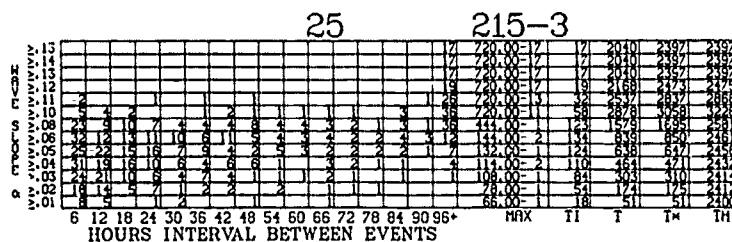
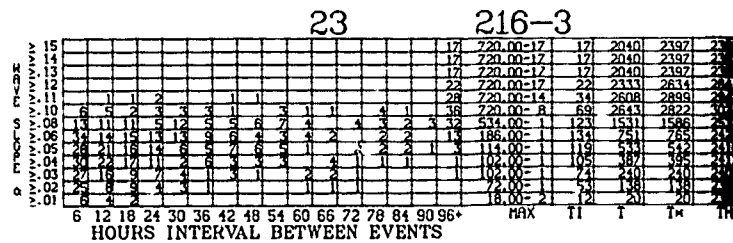
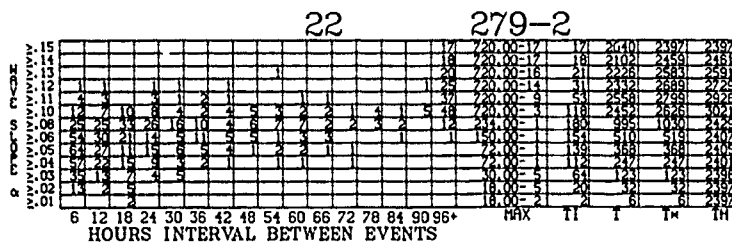
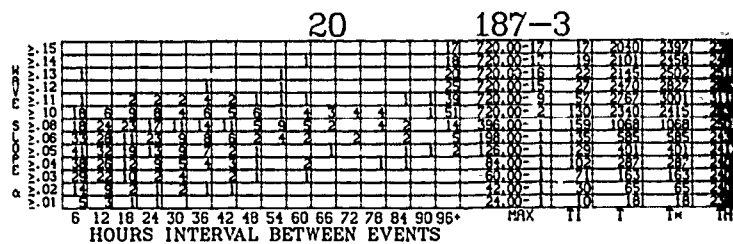
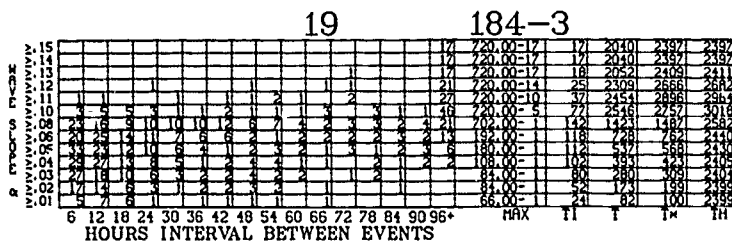


18 171-3





# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

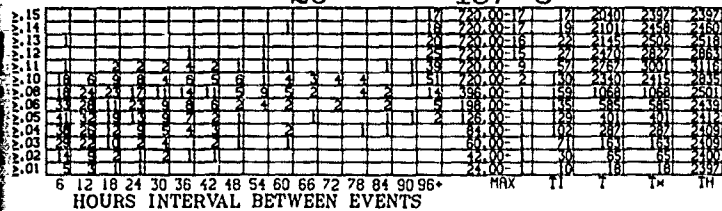


①

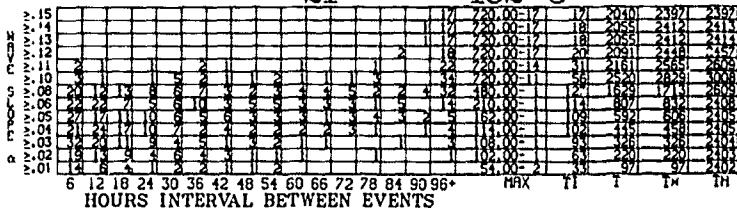
Cont'd)

APRIL

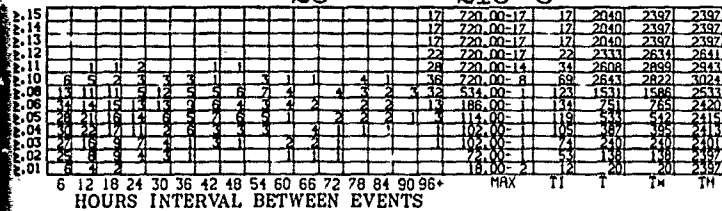
20 187-3



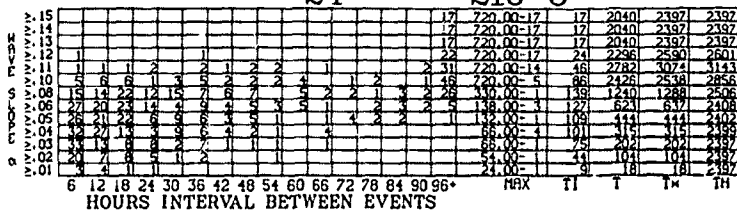
21 182-3



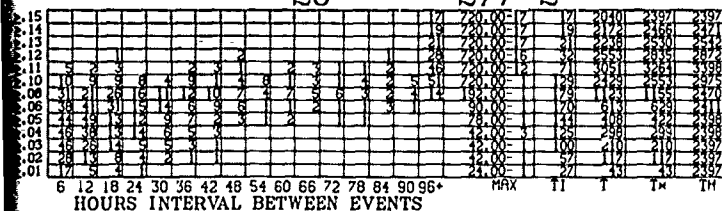
23 216-3



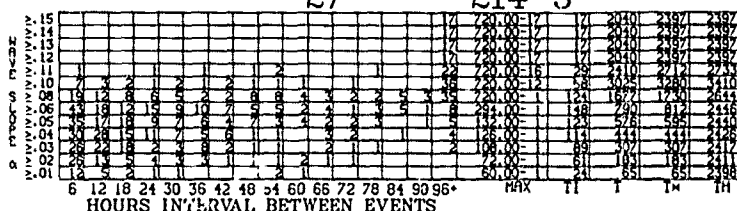
24 218-3



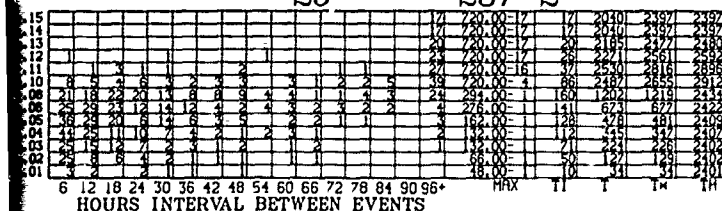
26 277-2



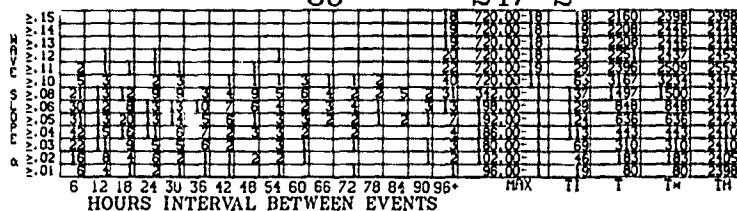
27 214-3



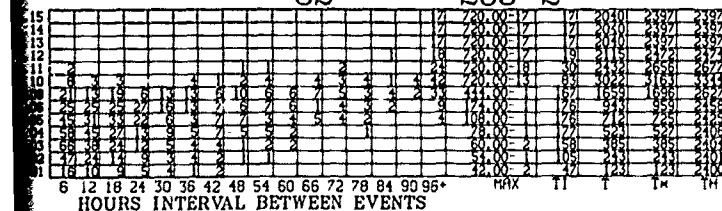
29 257-2



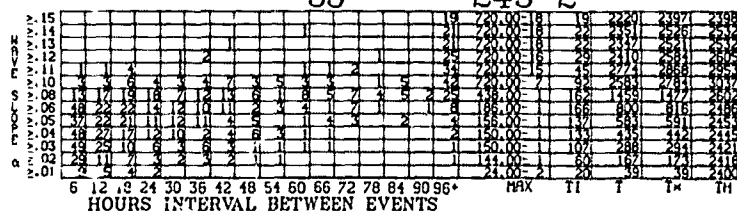
30 247-2



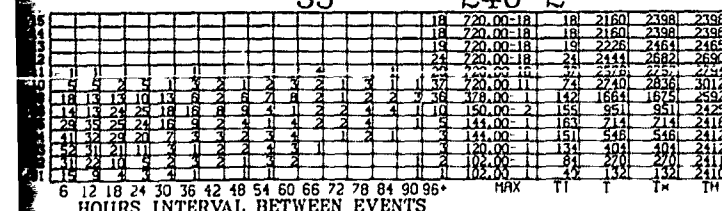
32 263-2



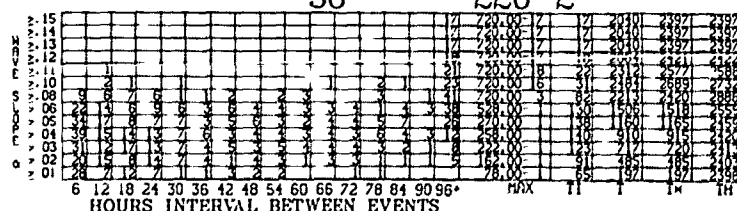
33 243-2



35 240-2

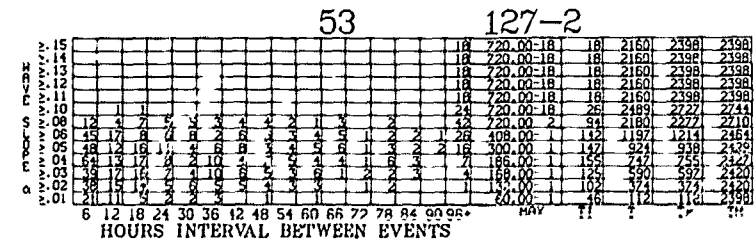
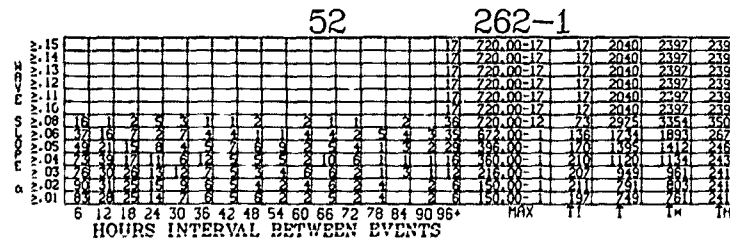
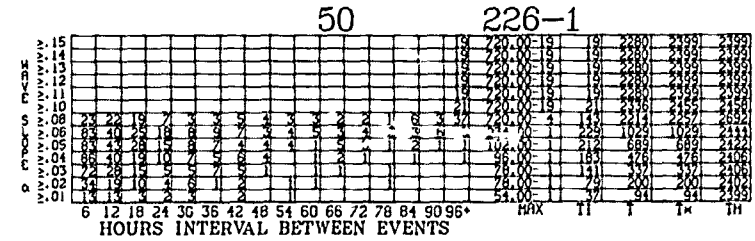
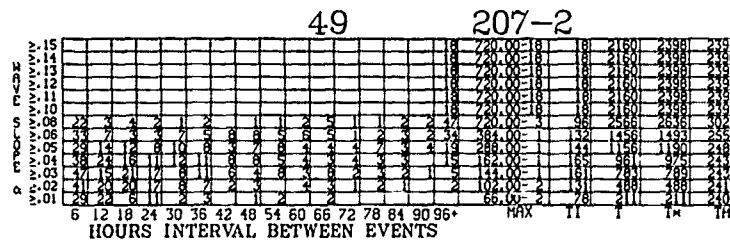
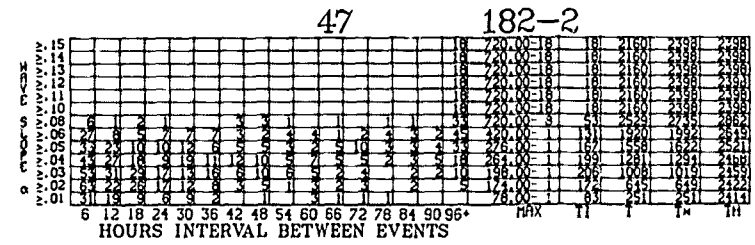
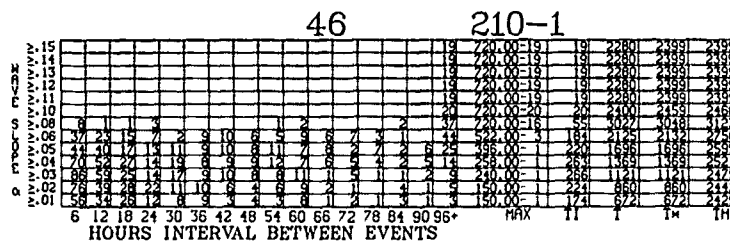
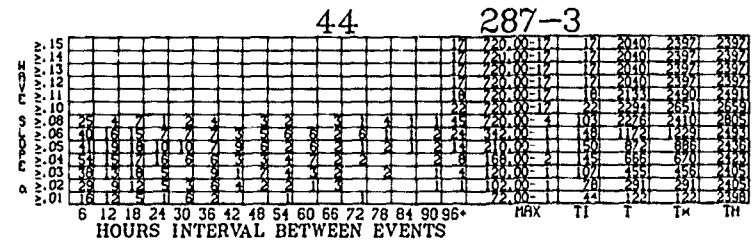
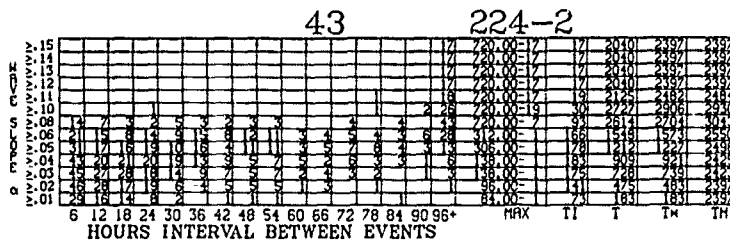
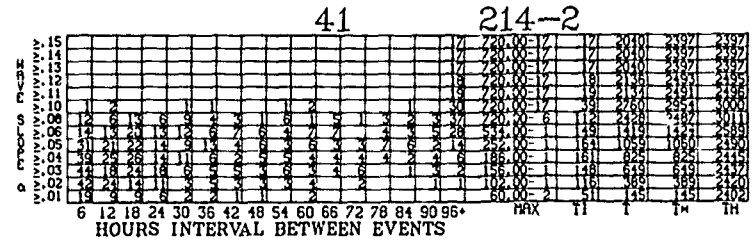
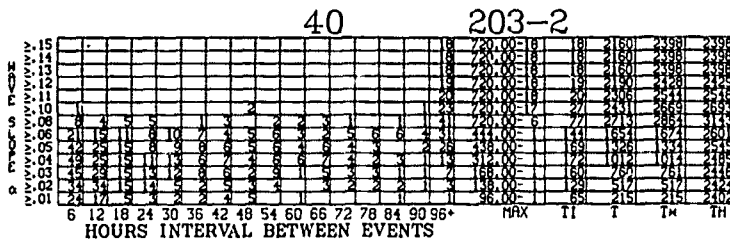
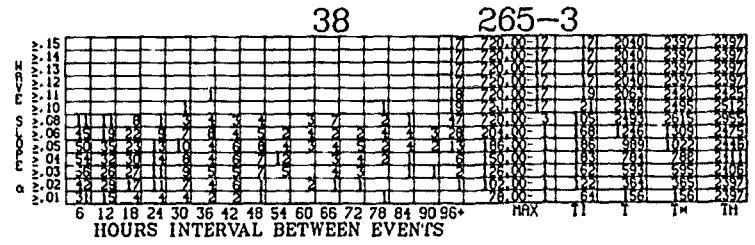
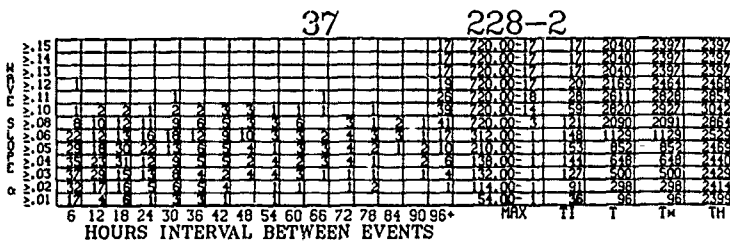


36 220-2



APRIL

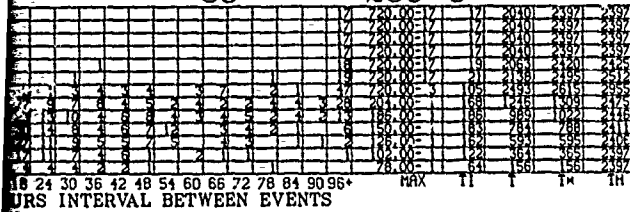
WAVE



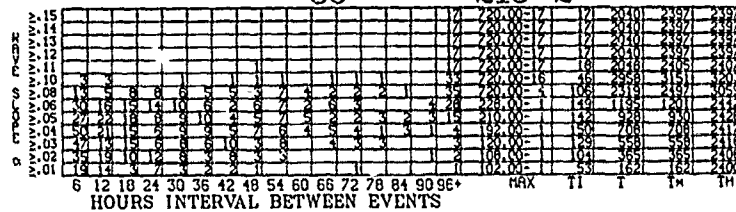
①

# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

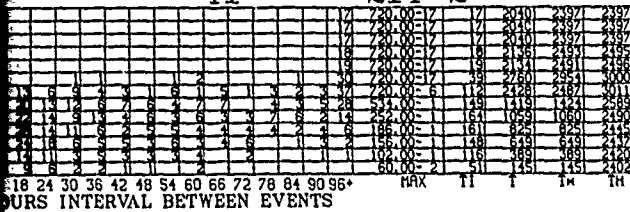
38 265-3



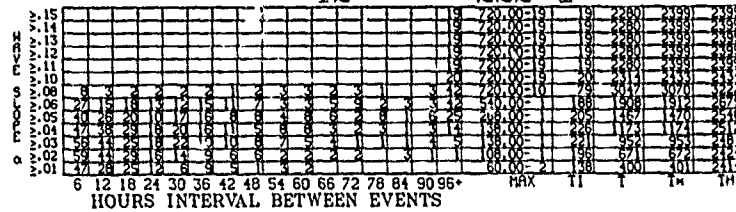
39 216-2



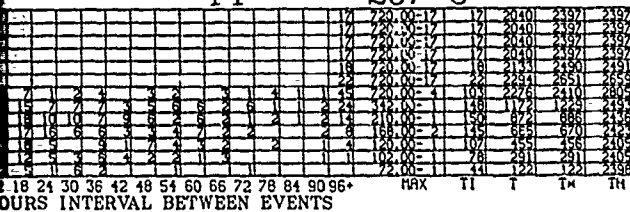
41 214-2



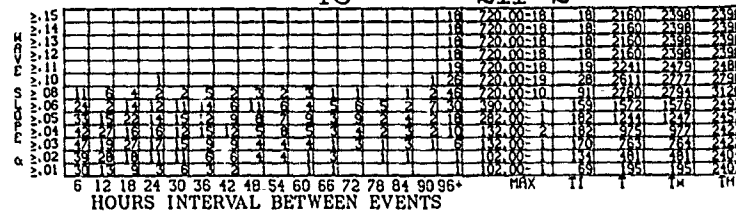
42 222-1



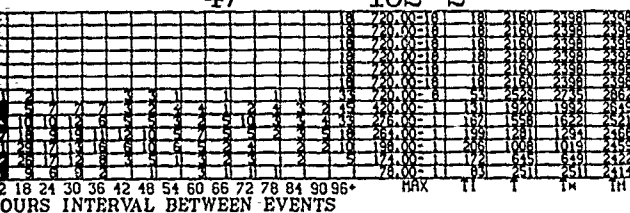
44 287-3



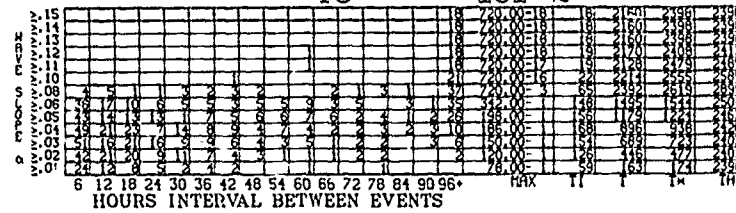
45 211-2



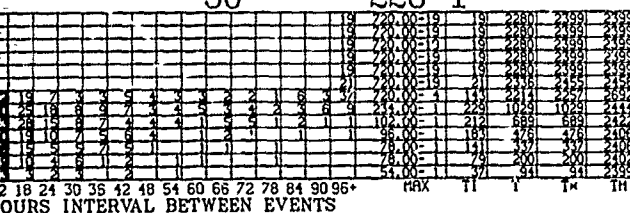
47 182-2



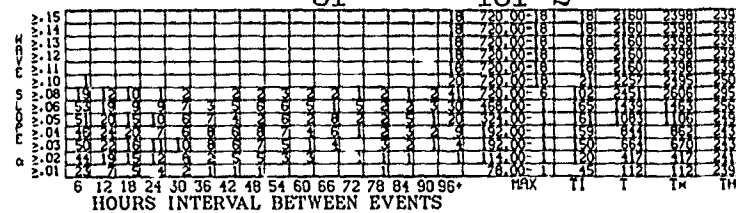
48 151-2



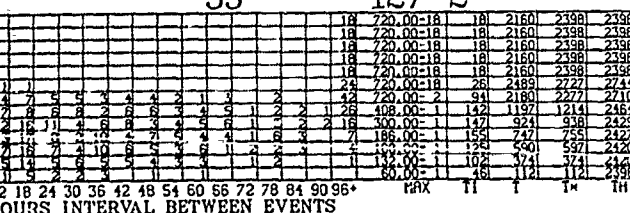
50 226-1



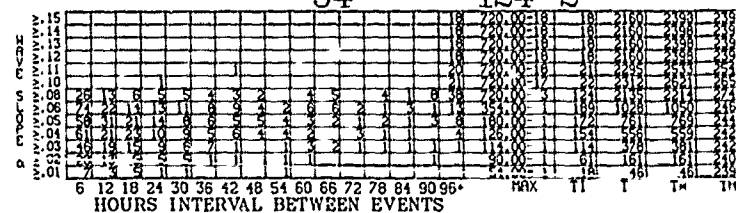
51 161-2



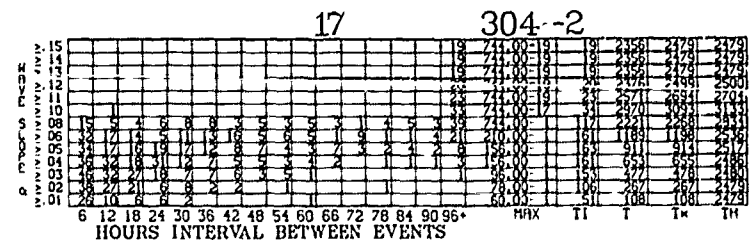
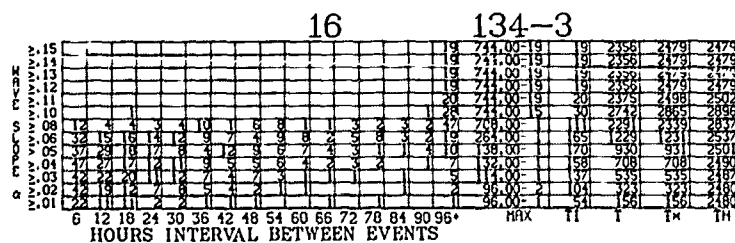
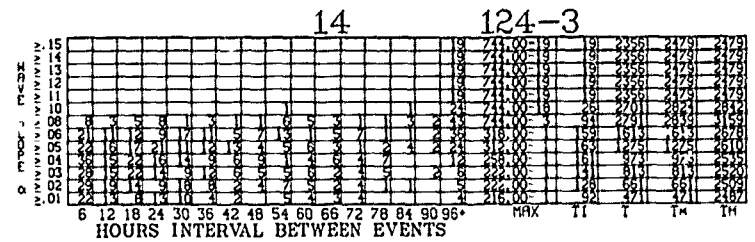
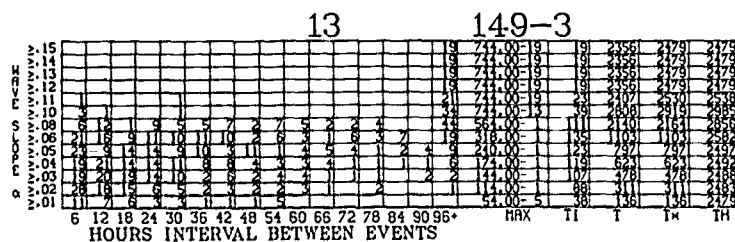
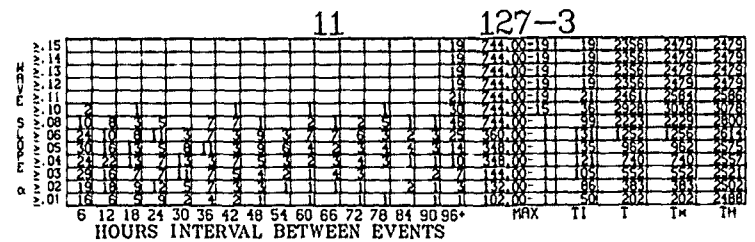
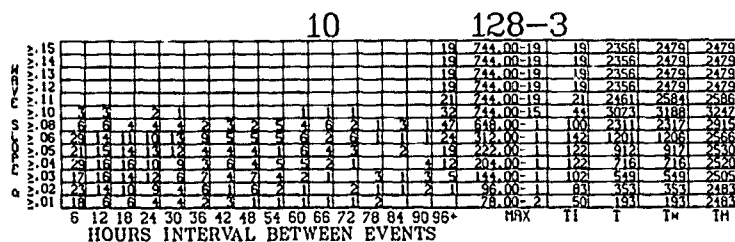
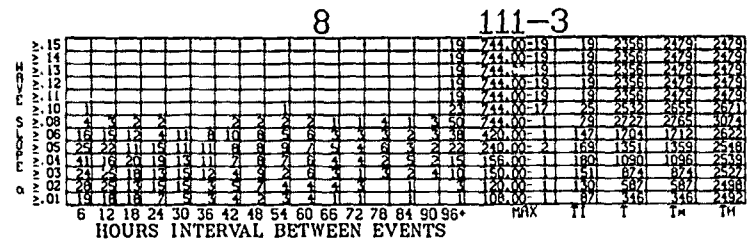
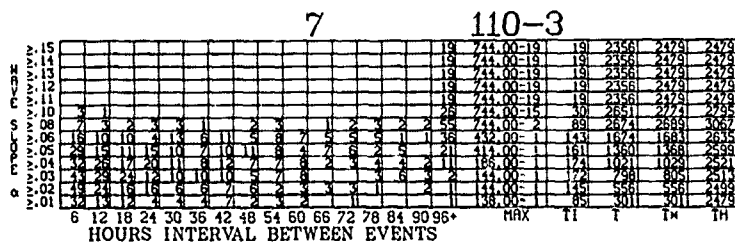
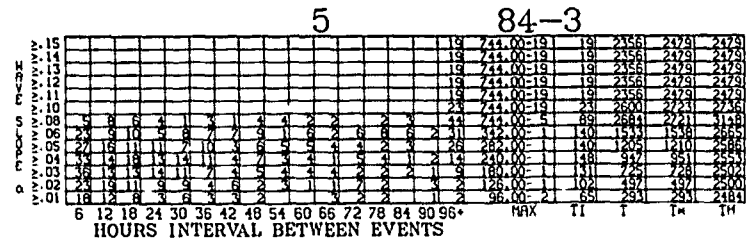
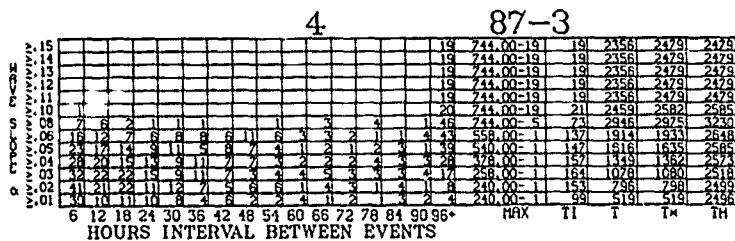
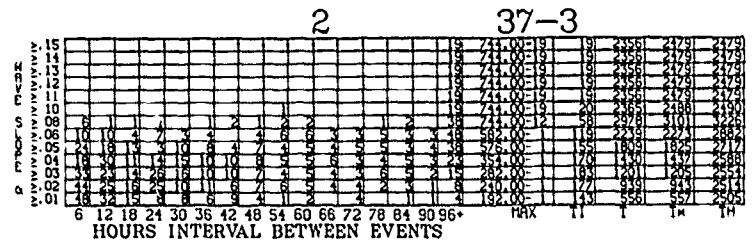
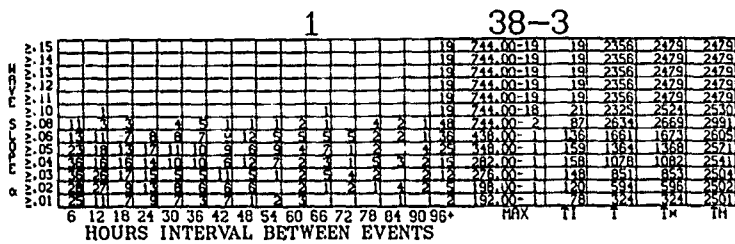
53 127-2



54 124-2



# WAVE SLOPE ( $\alpha$ ) INTERVALS

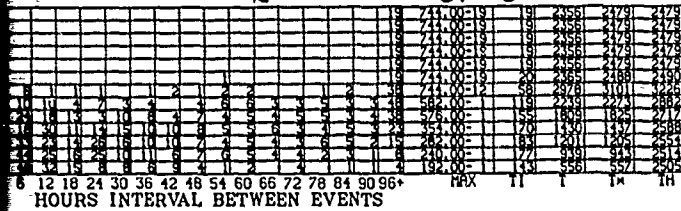


①

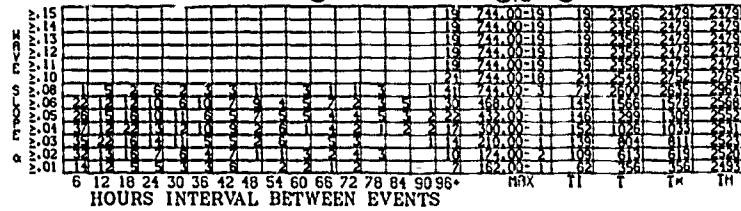


JULY

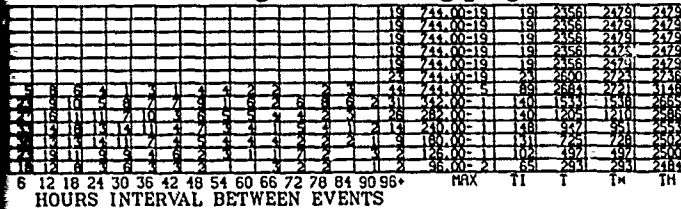
2 37-3



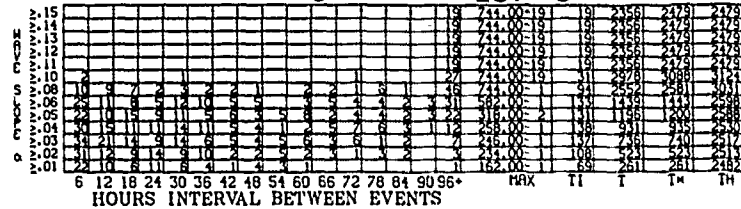
3 62-3



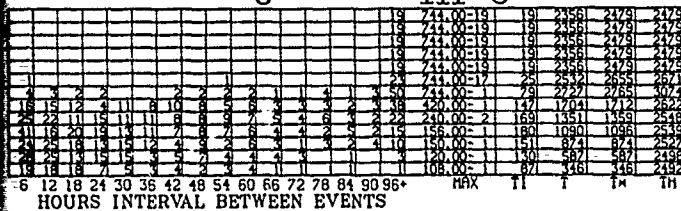
5 84-3



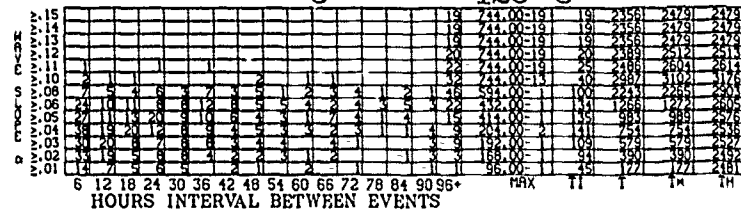
6 107-3



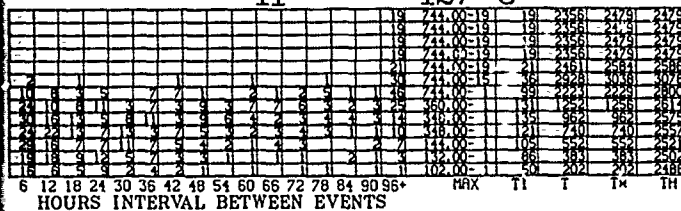
8 111-3



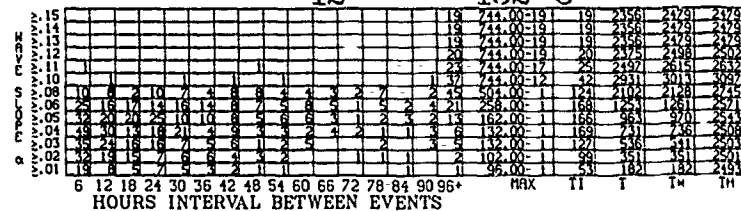
9 129-3



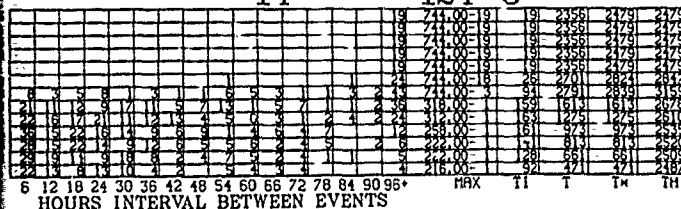
11 127-3



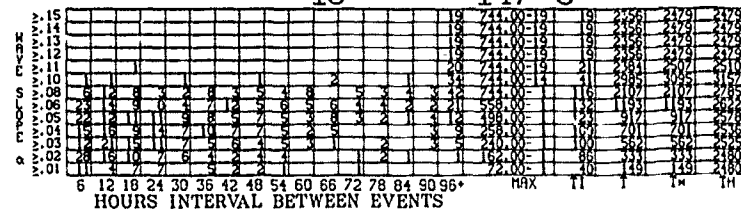
12 132-3



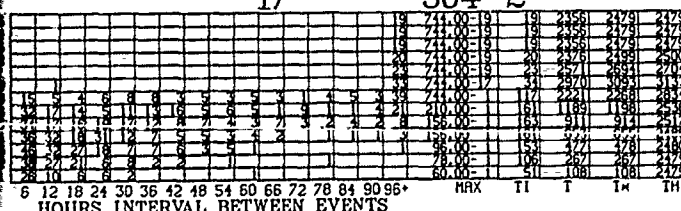
14 124-3



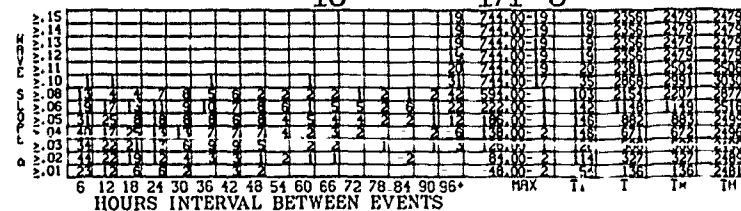
15 147-3



17 304-2



18 171-3

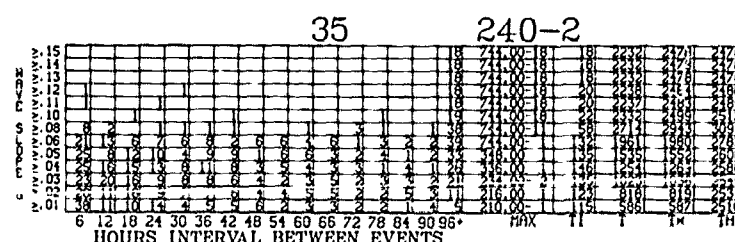
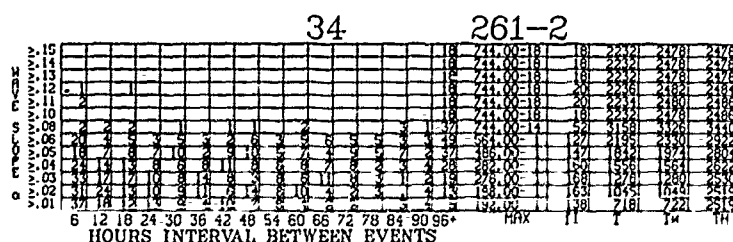
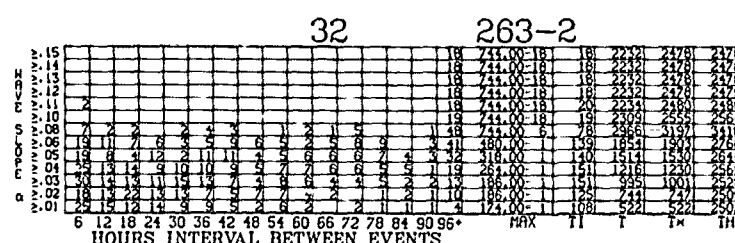
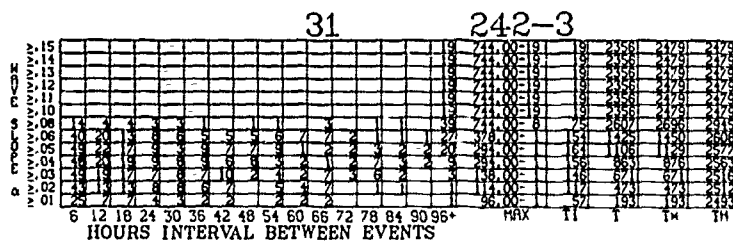
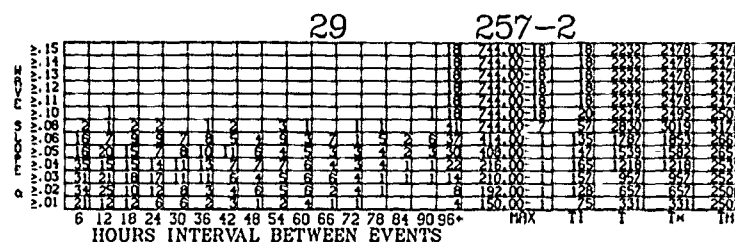
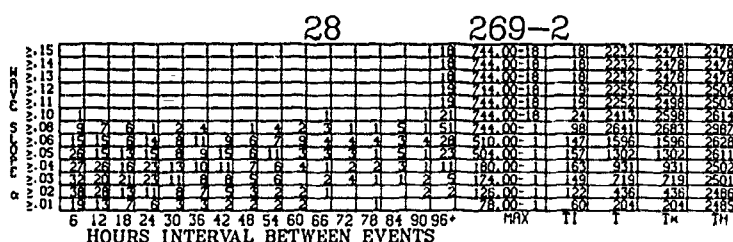
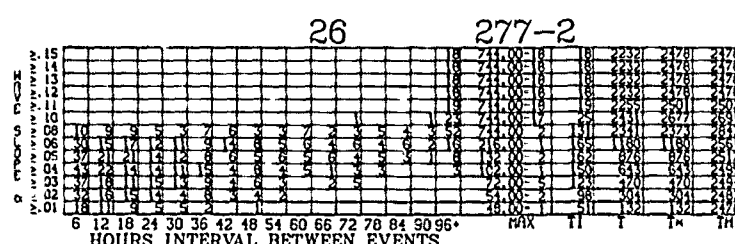
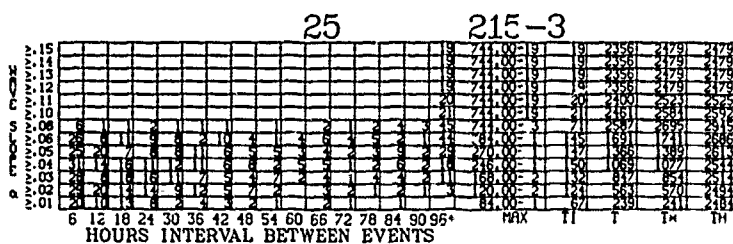
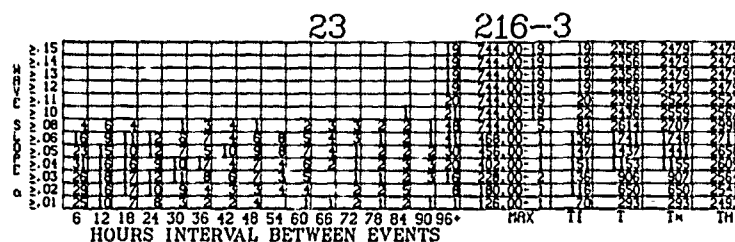
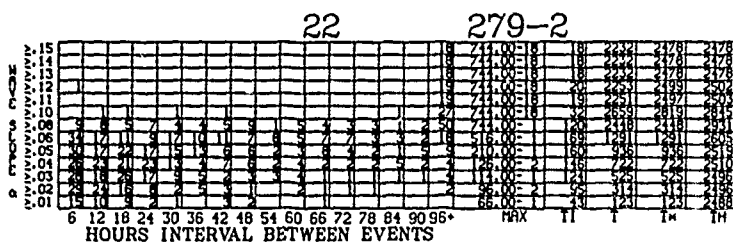
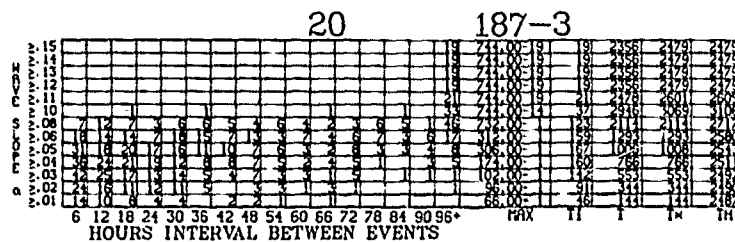
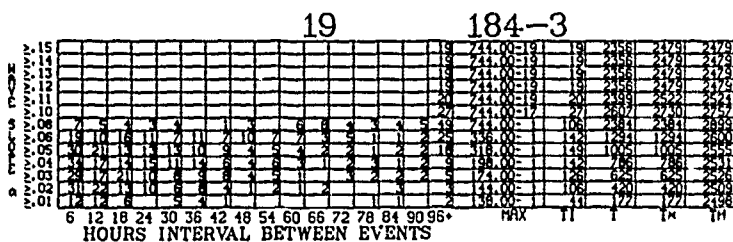


(2)



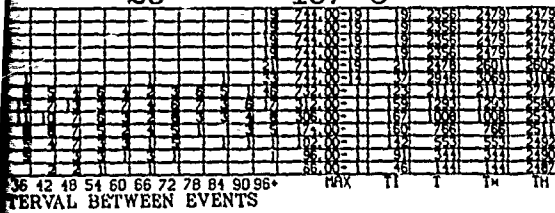
JULY

WAVE 9

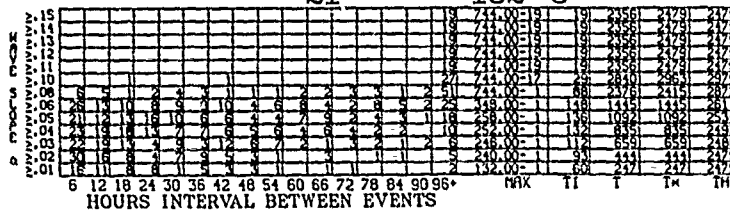


# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

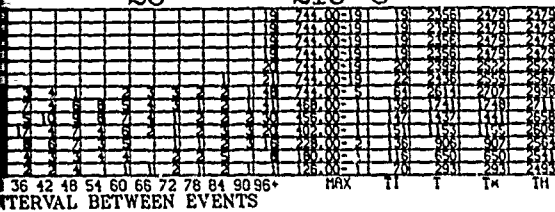
20 187-3



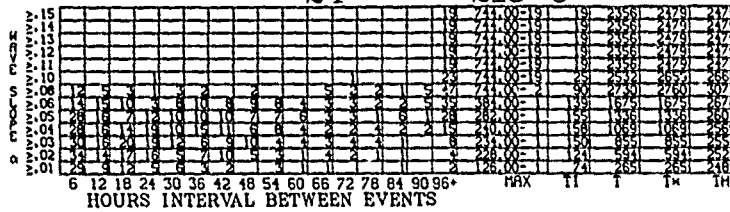
21 182-3



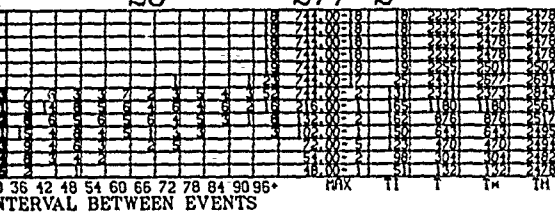
23 216-3



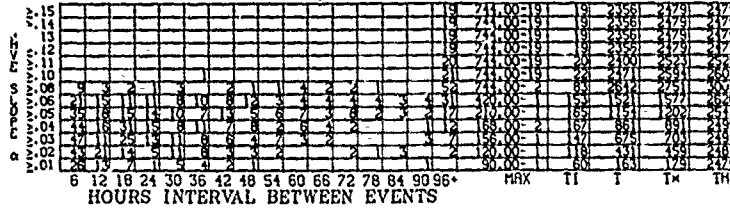
24 218-3



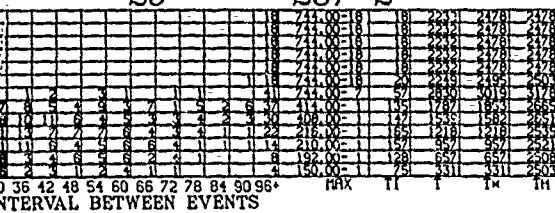
26 277-2



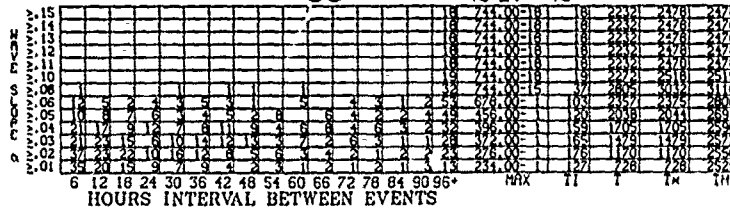
27 214-3



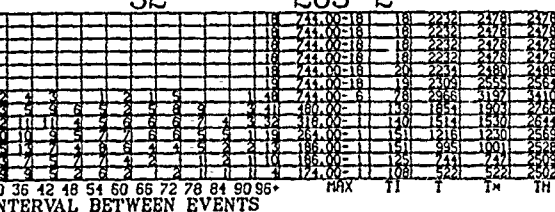
29 257-2



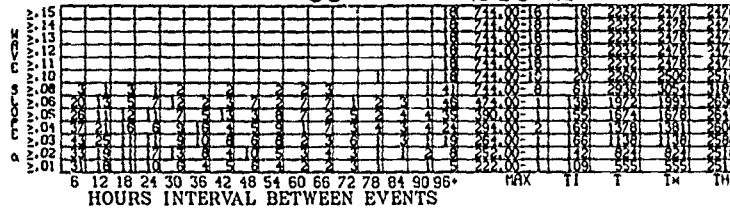
30 247-2



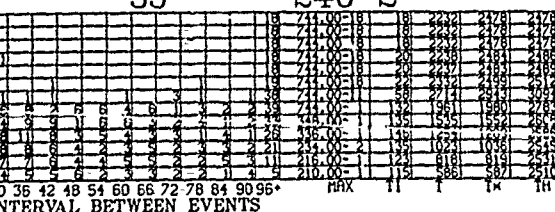
32 263-2



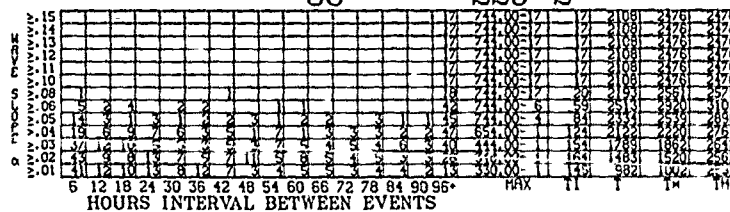
33 243-2



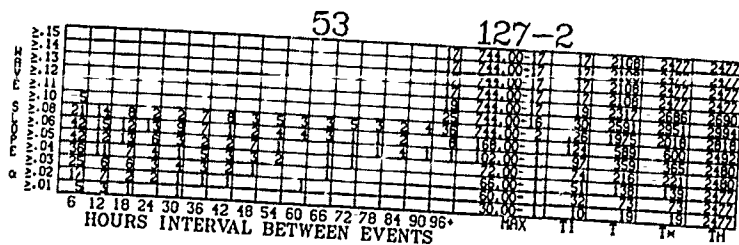
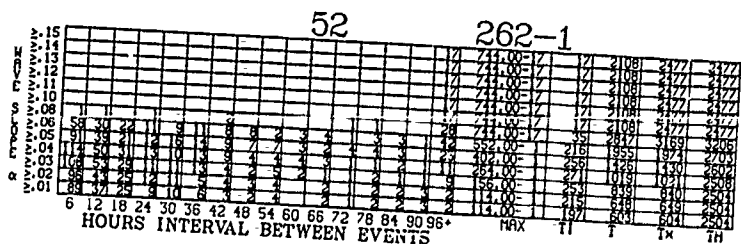
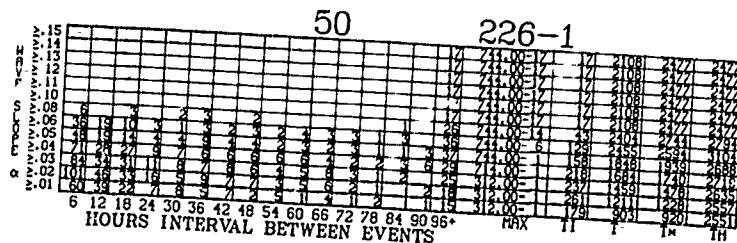
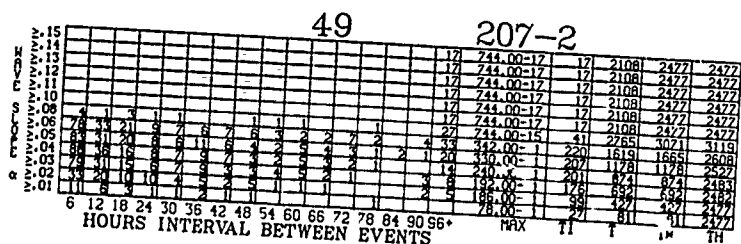
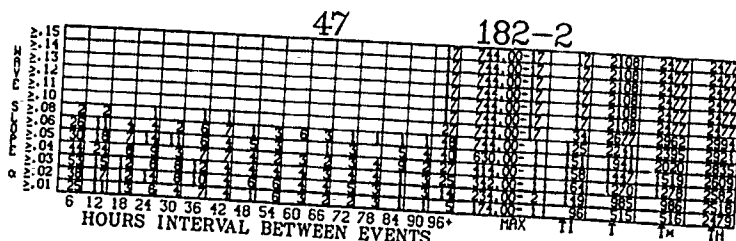
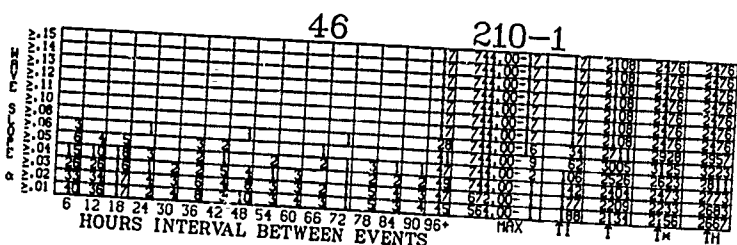
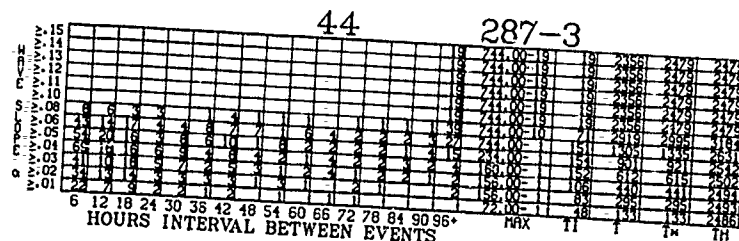
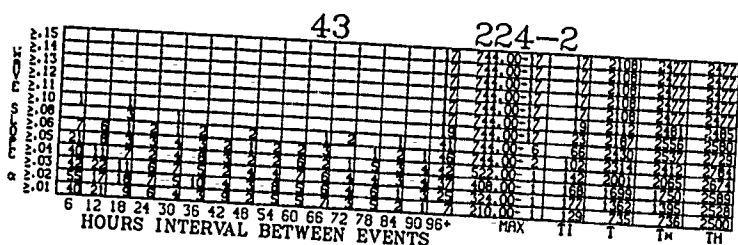
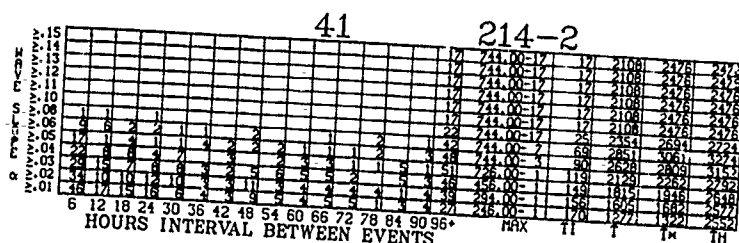
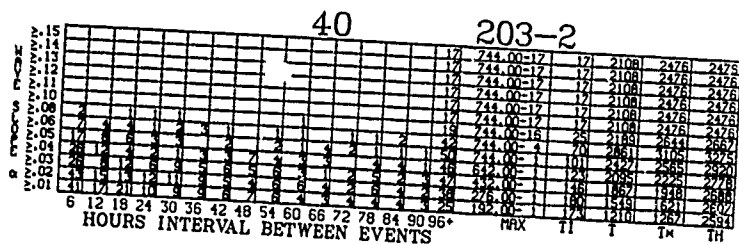
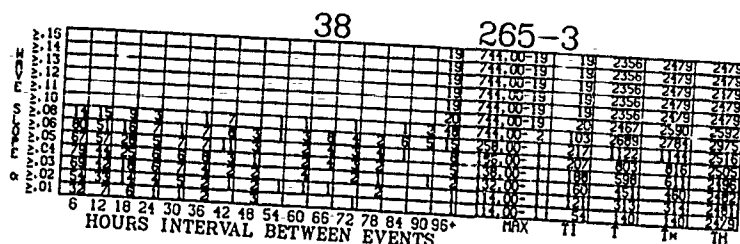
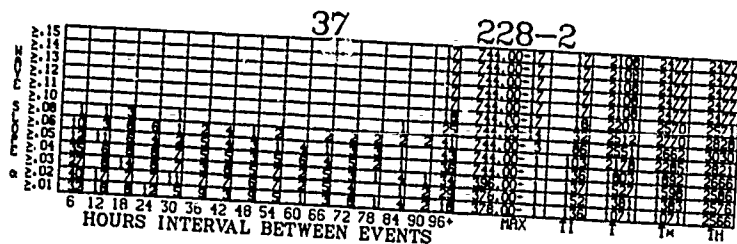
35 240-2



36 220-2



# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

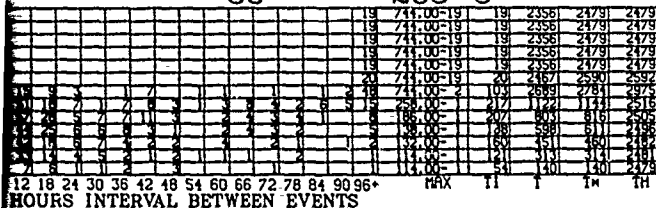


d)

JULY

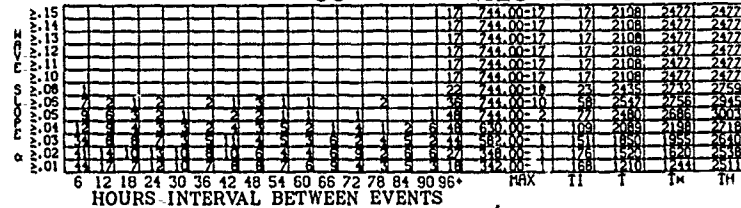
38

265-3



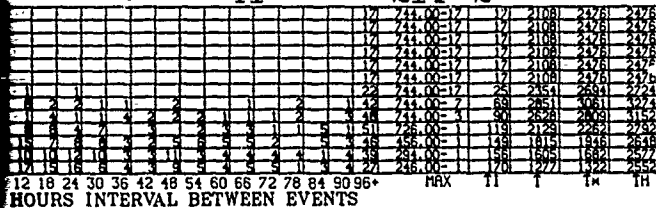
39

216-2



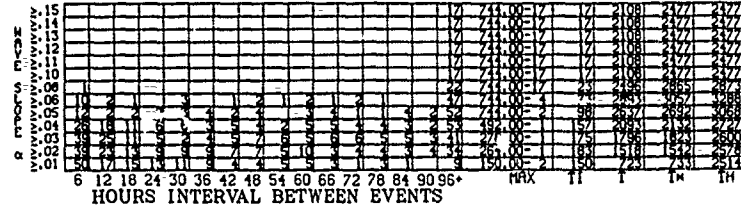
41

214-2



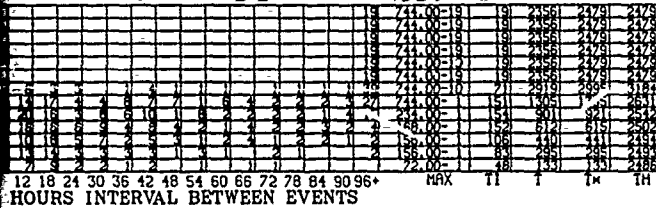
42

222-1



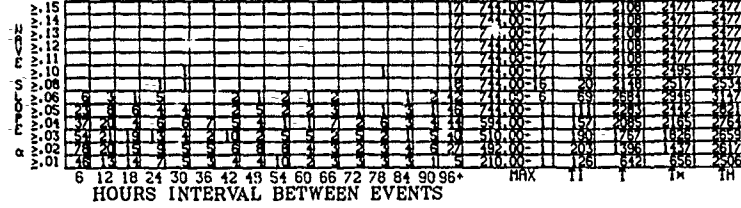
44

287-3



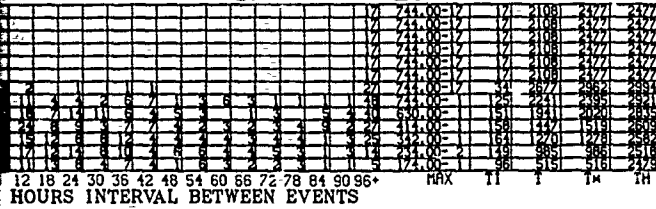
45

211-2



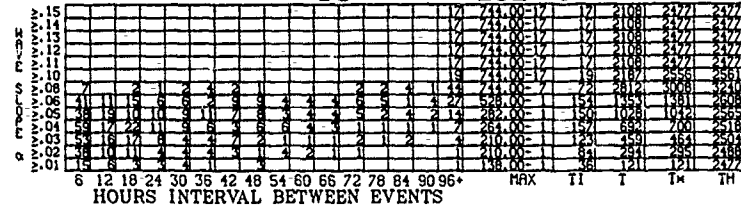
47

182-2



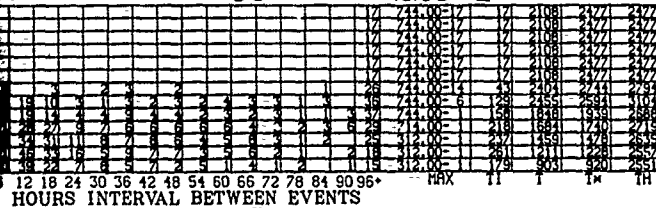
48

151-2



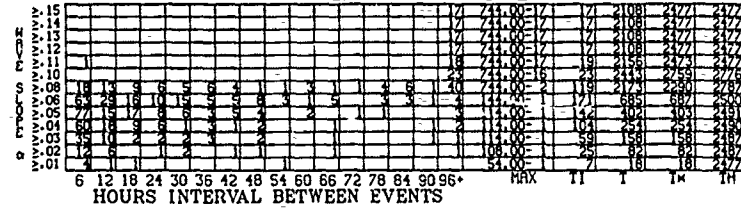
50

226-1



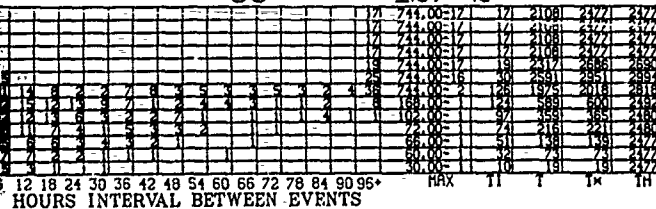
51

161-2



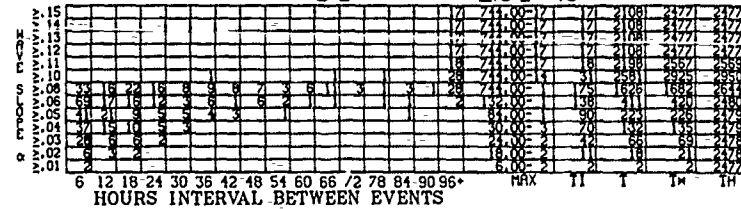
53

127-2

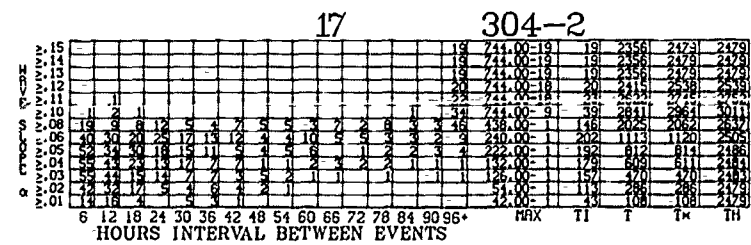
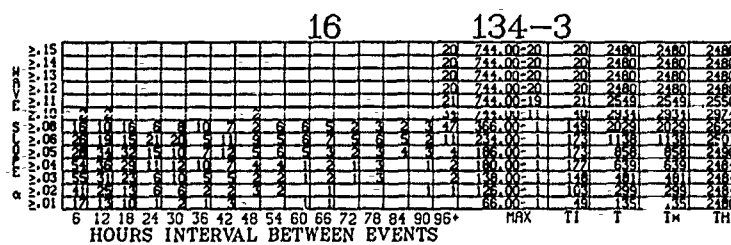
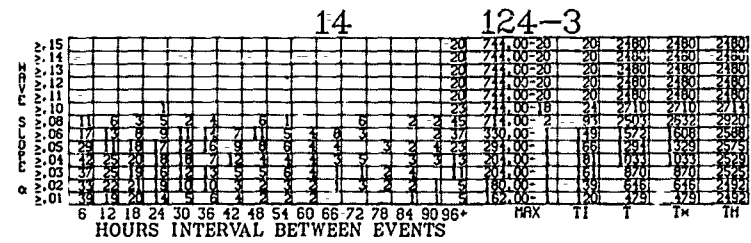
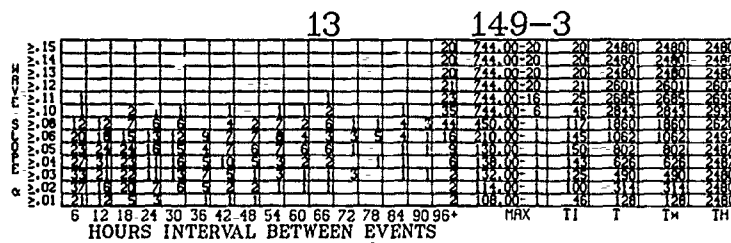
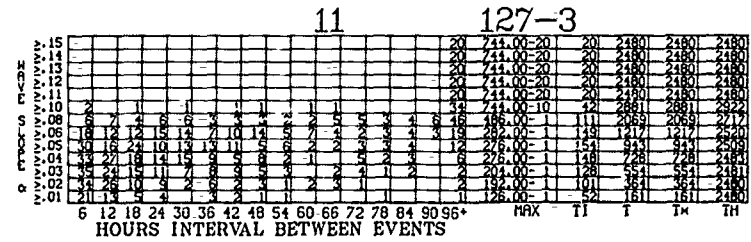
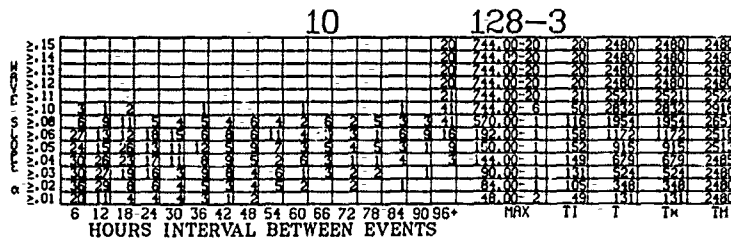
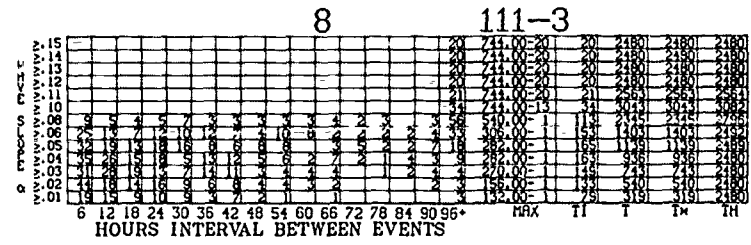
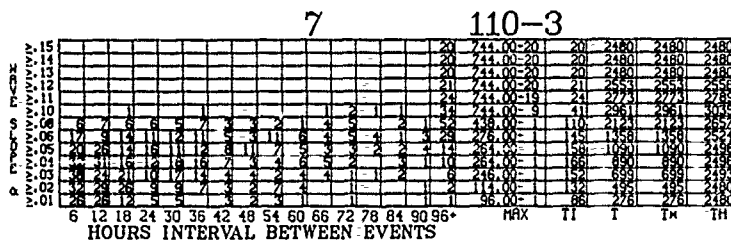
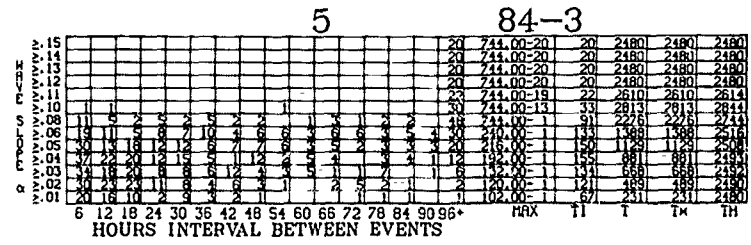
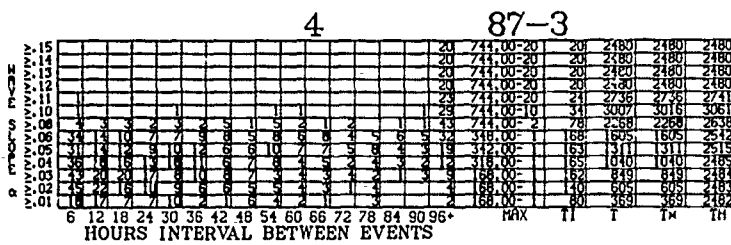
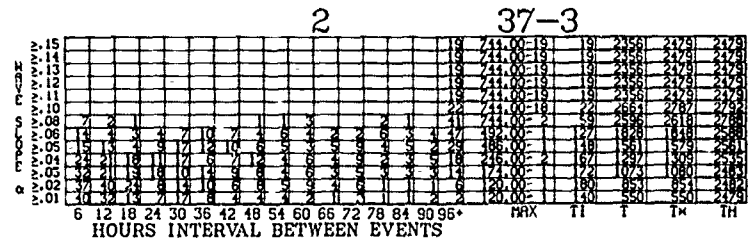
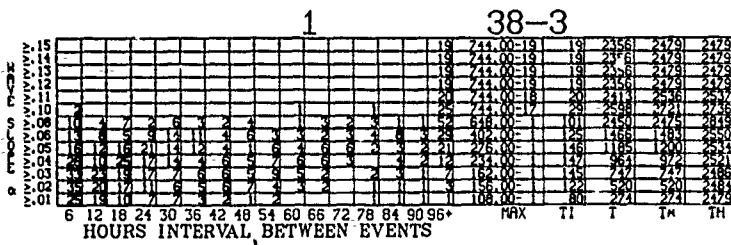


54

124-2

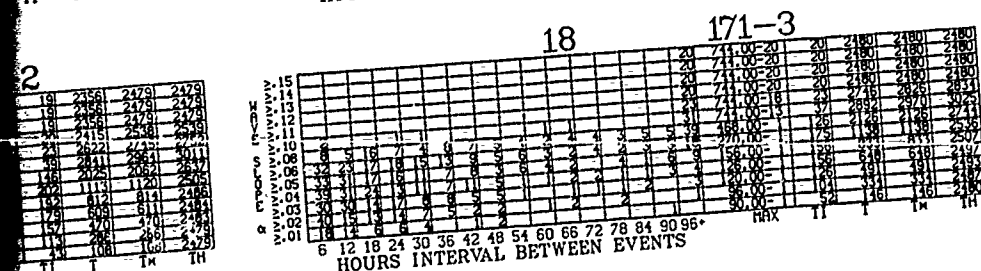
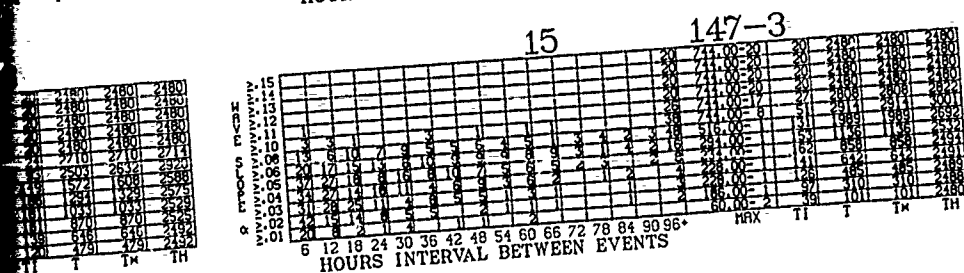
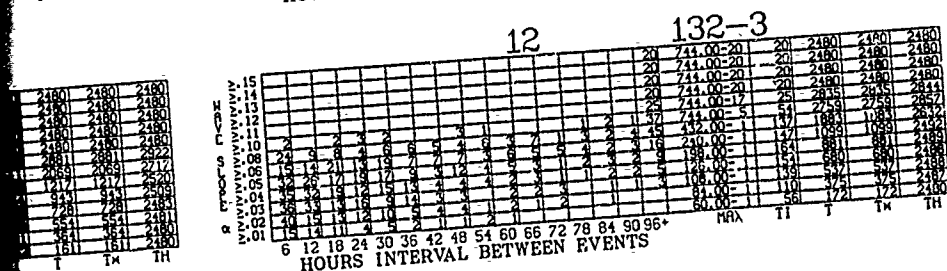
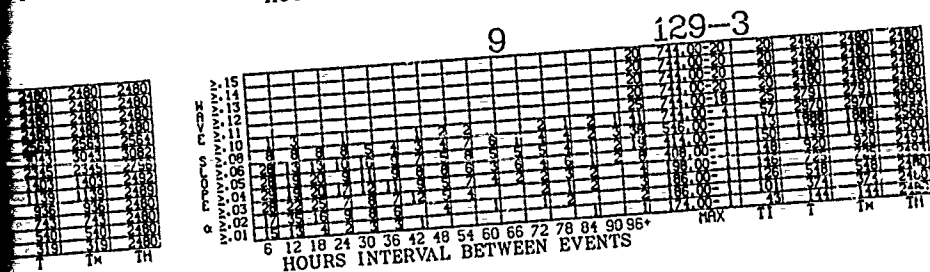
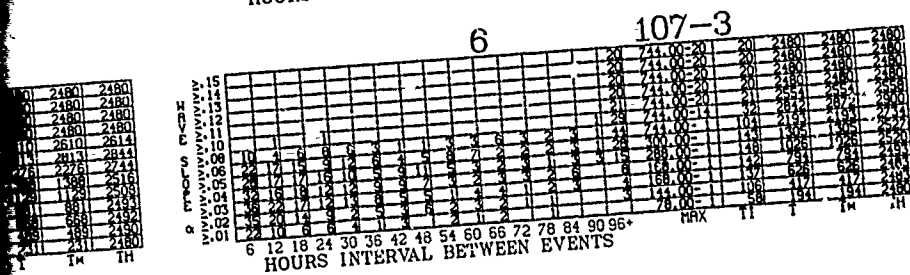
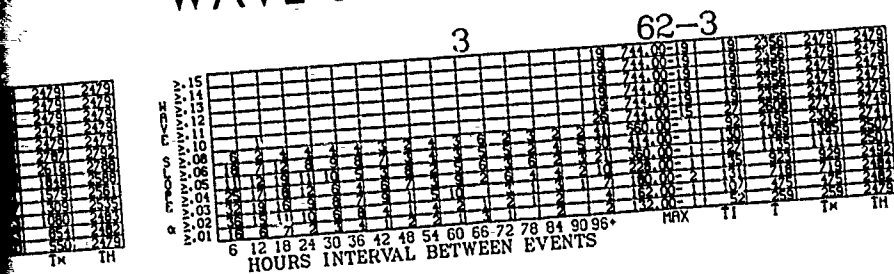


# AUGUST





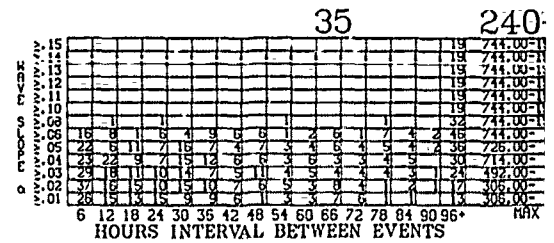
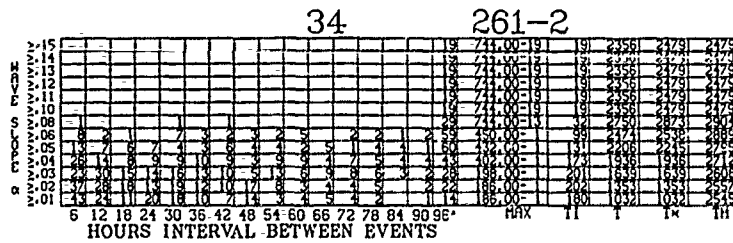
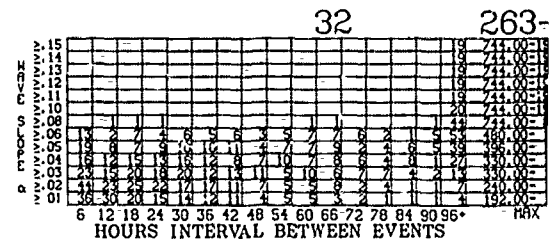
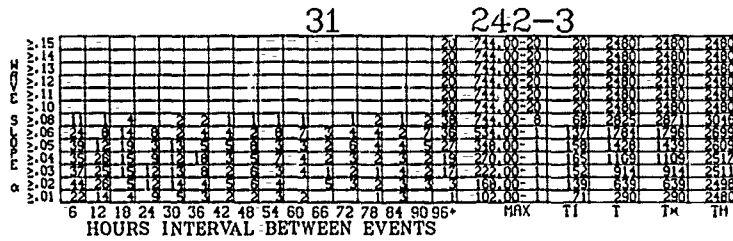
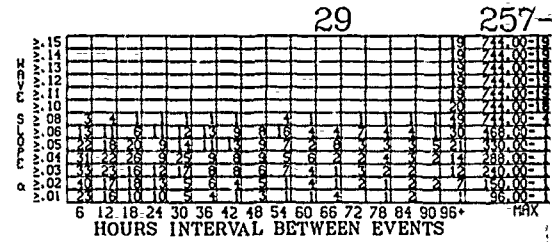
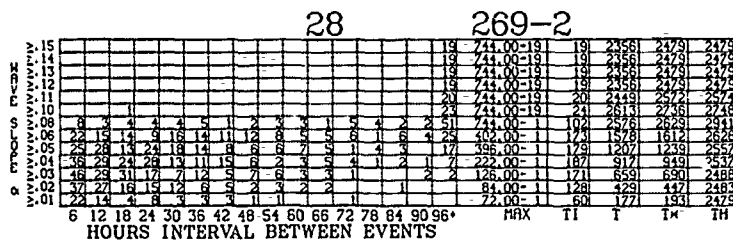
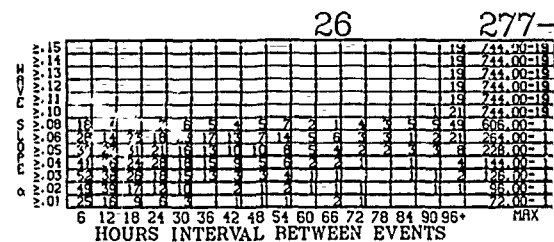
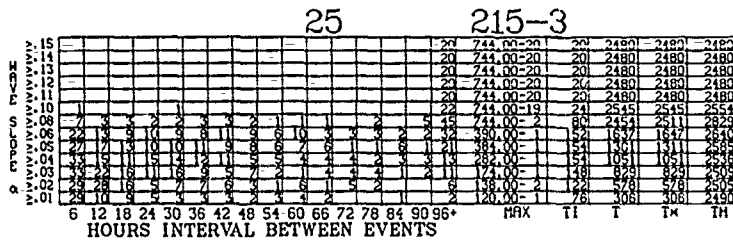
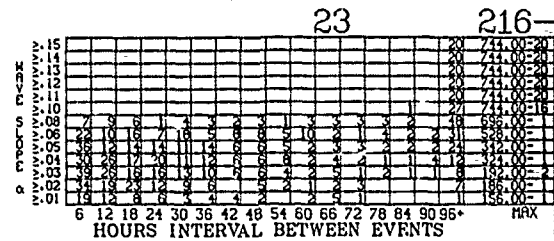
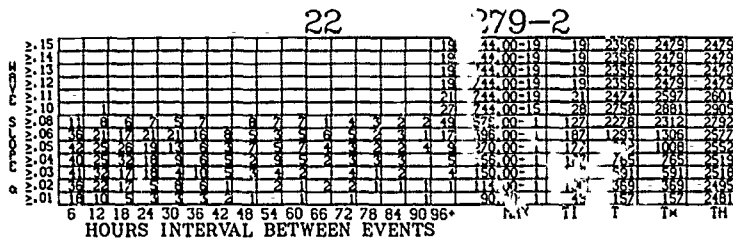
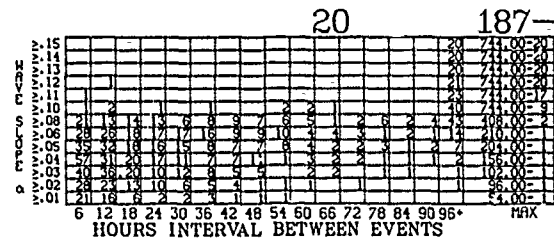
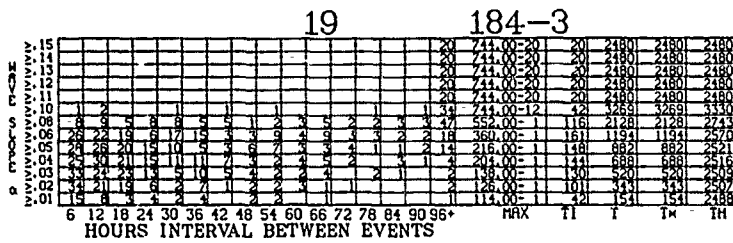
## WAVE SLOPE ( $\alpha$ ) INTERVALS



②



# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

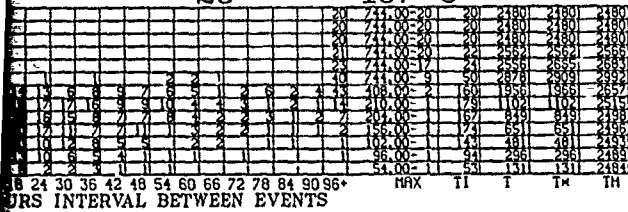


0

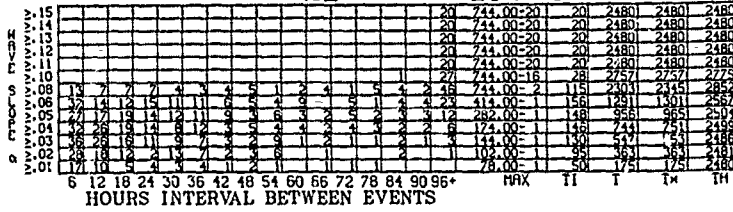
10

# AUGUST

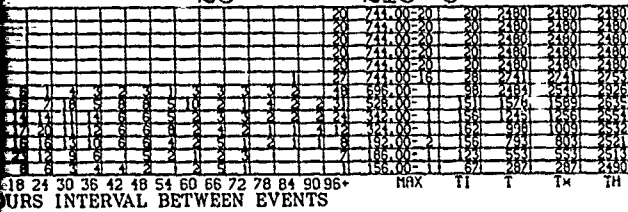
20 187-3



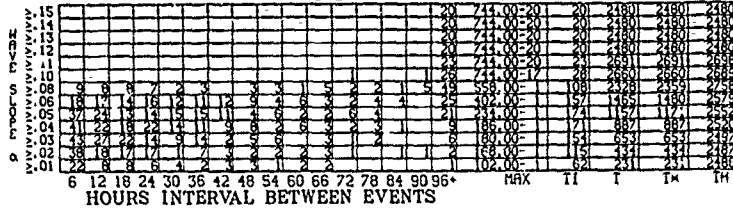
21 182-3



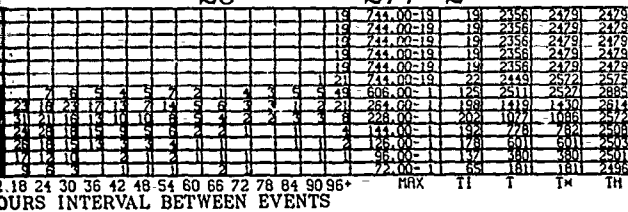
23 216-3



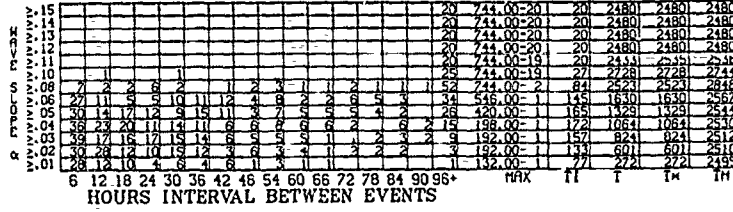
24 218-3



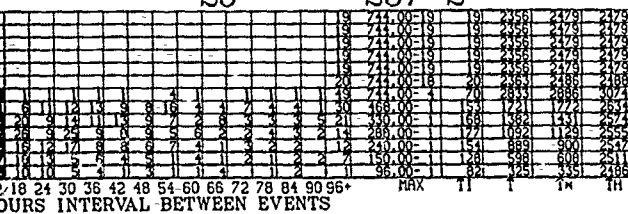
26 277-2



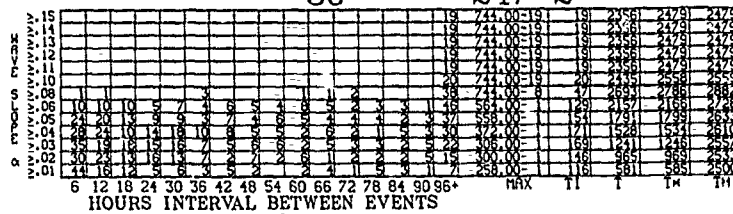
27 214-3



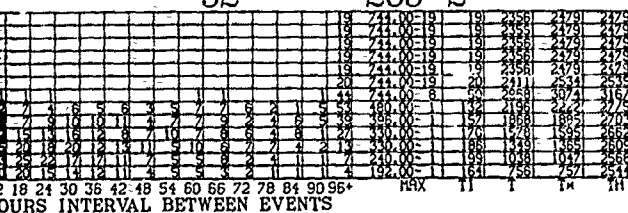
29 257-2



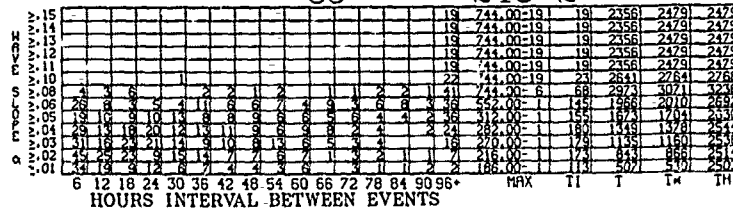
30 247-2



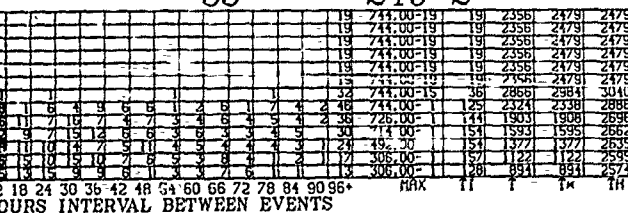
32 263-2



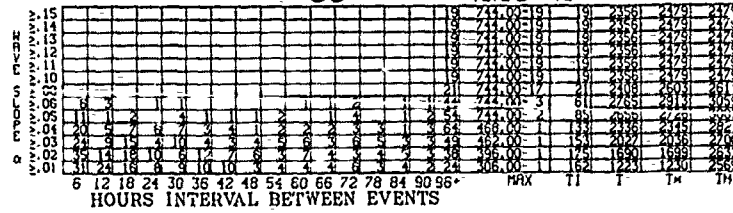
33 243-2



35 240-2

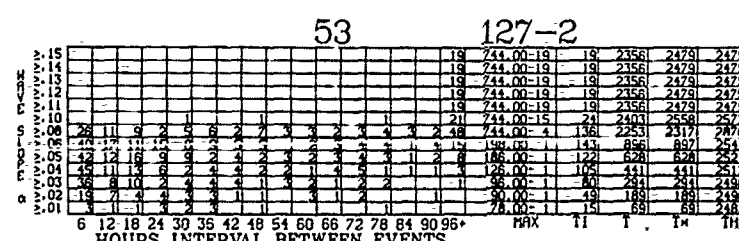
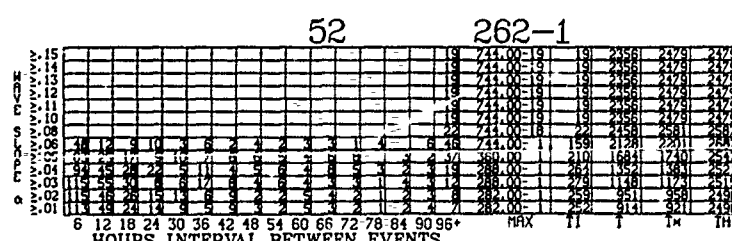
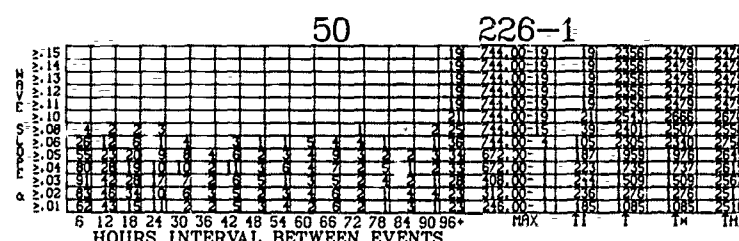
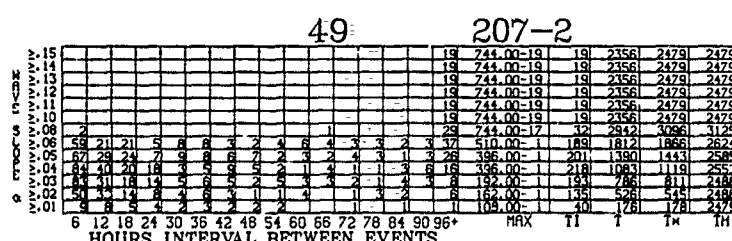
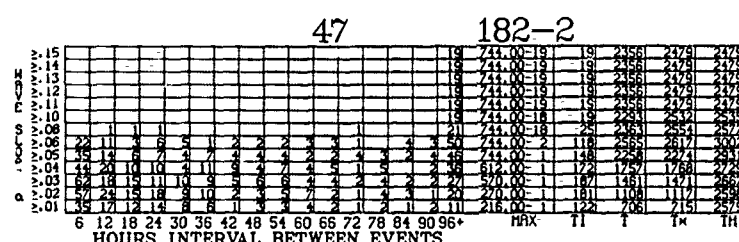
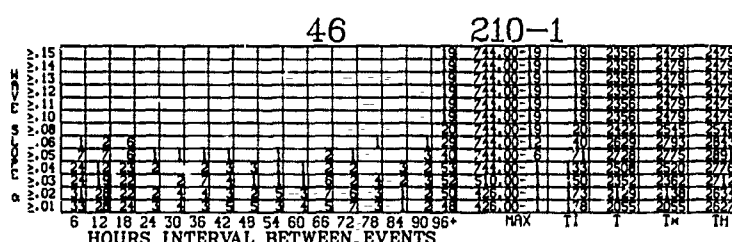
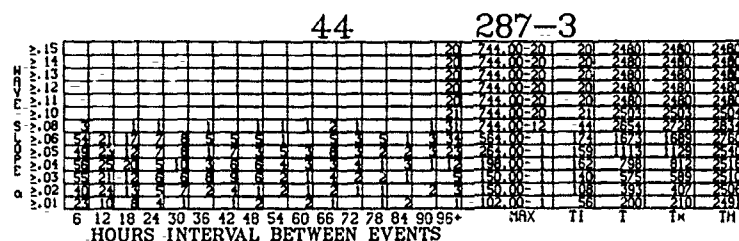
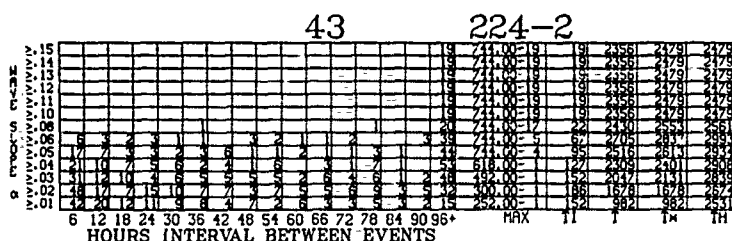
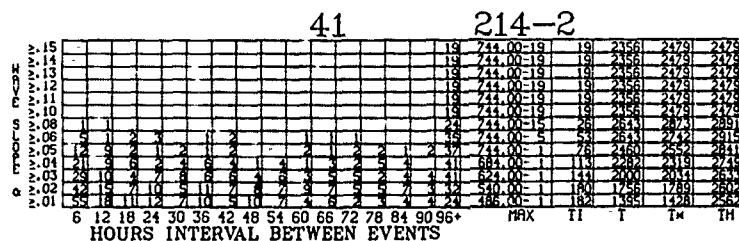
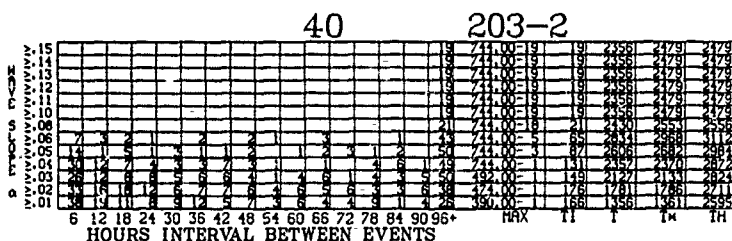
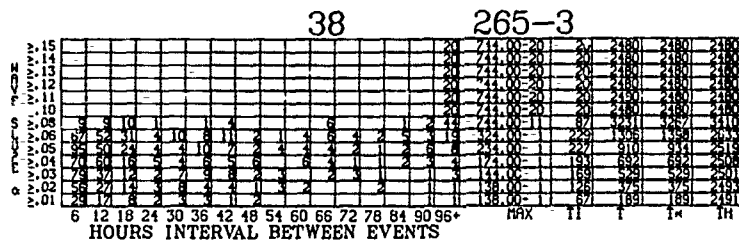
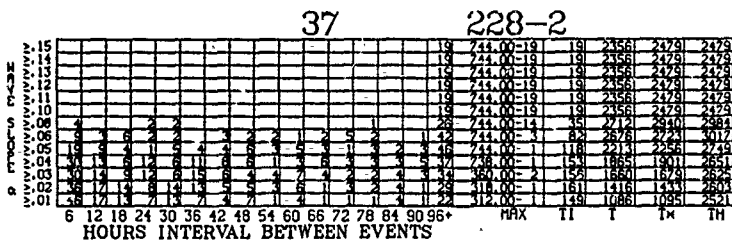


36 220-2



# AUGUST

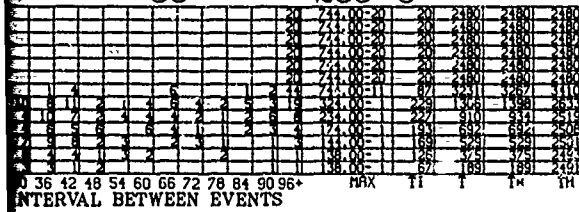
# WAVE



# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

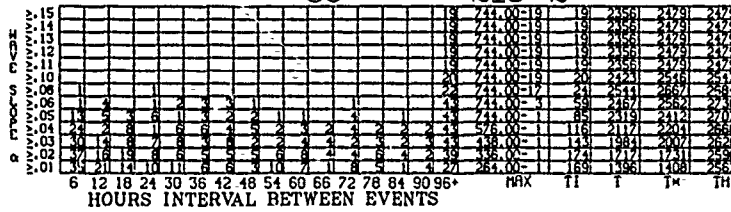
38

265-3



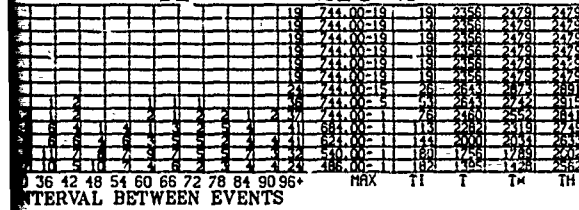
39

216-2



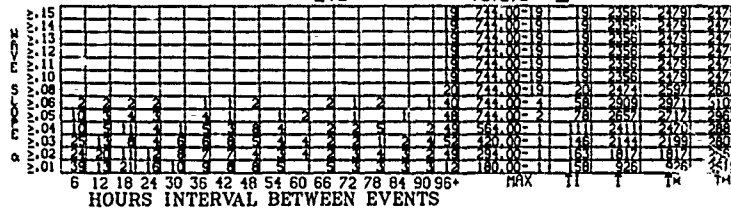
41

214-2



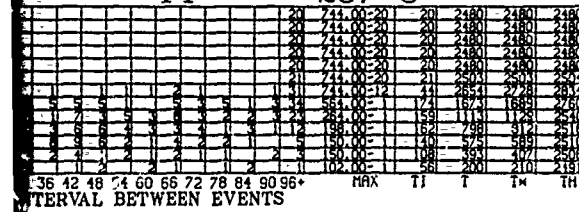
42

222-1



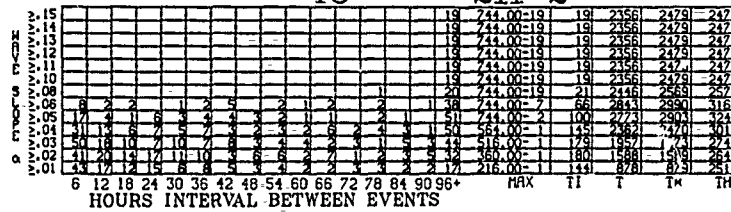
44

287-3



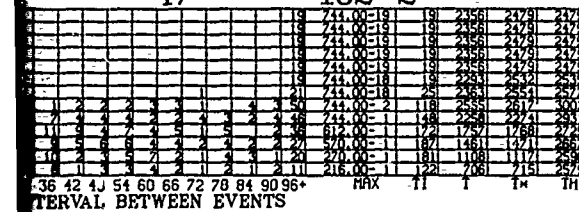
45

211-2



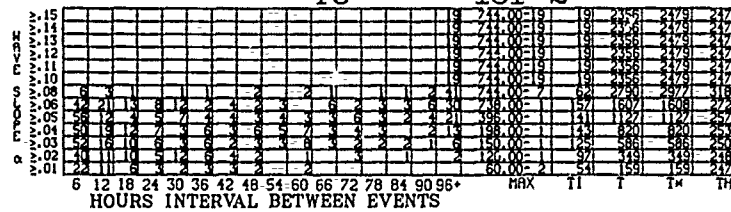
47

182-2



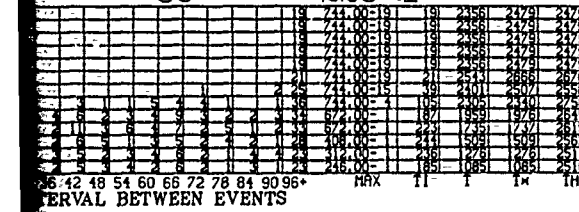
48

151-2



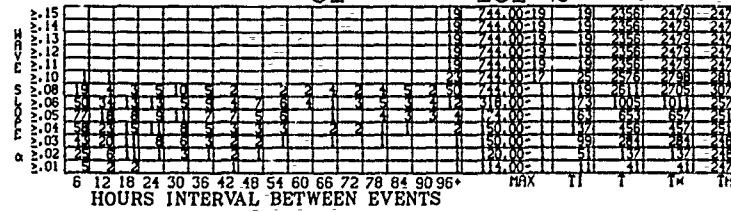
50

226-1



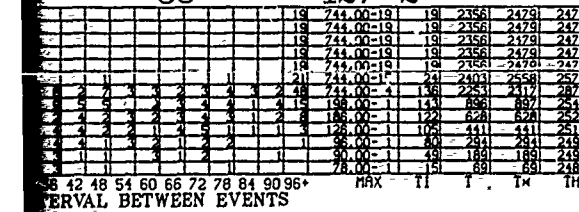
51

161-2



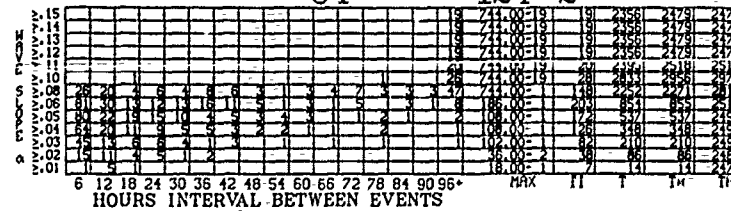
53

127-2



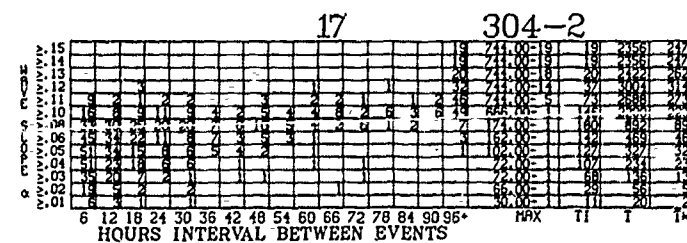
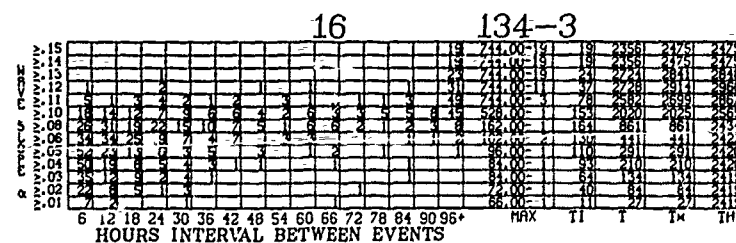
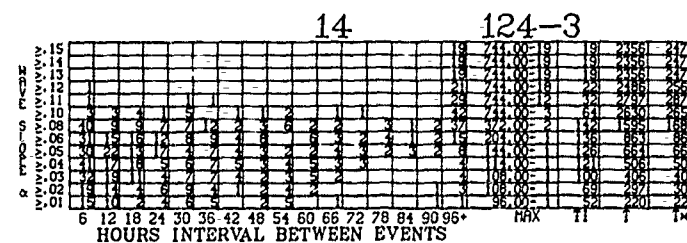
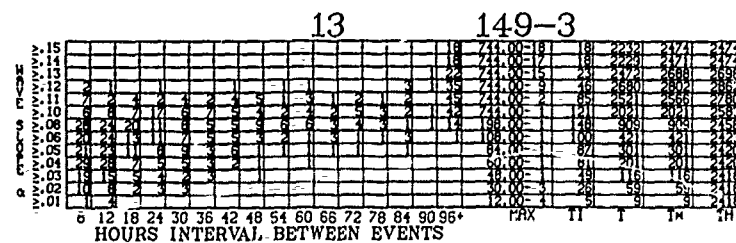
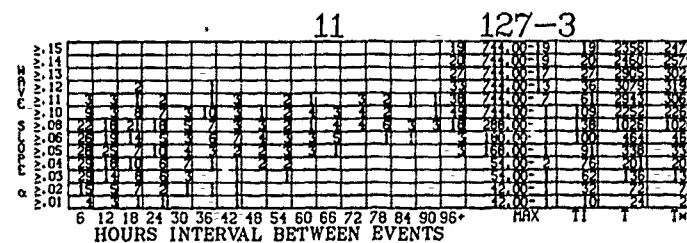
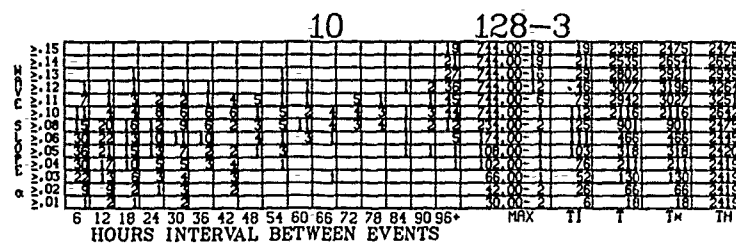
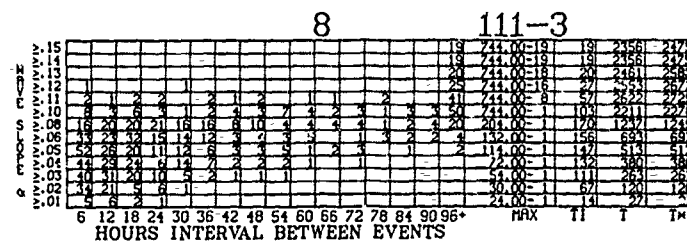
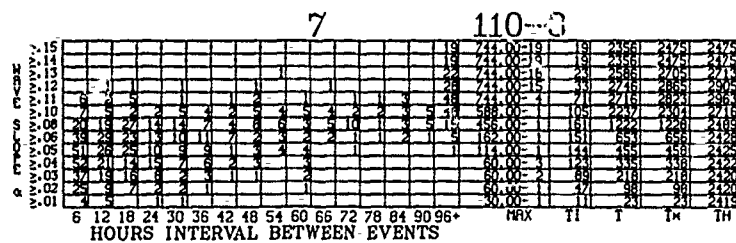
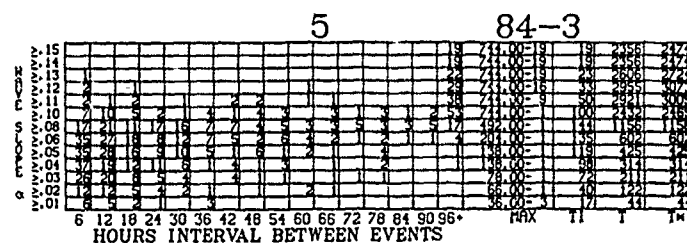
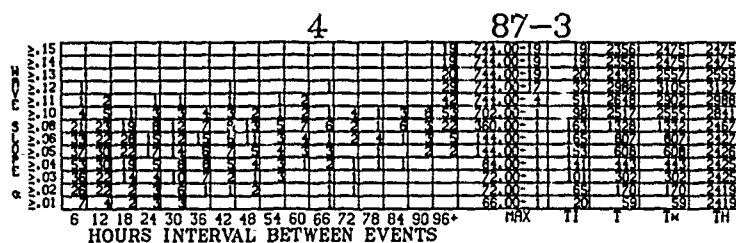
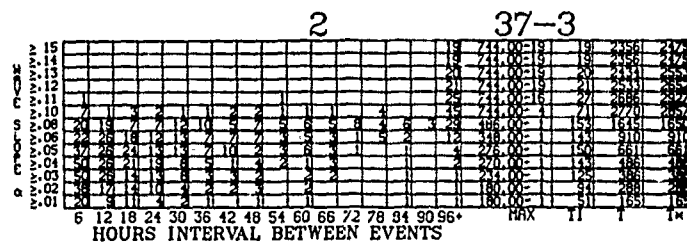
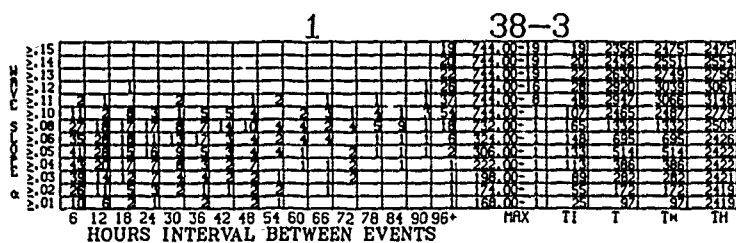
54

124-2



2

# WAVE SLOPE ( $\alpha$ ) INTERVALS

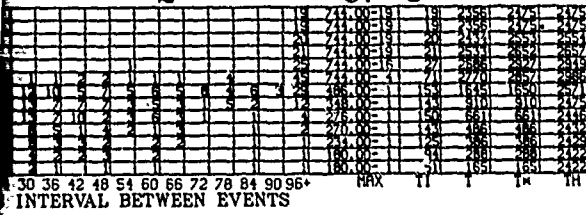


①

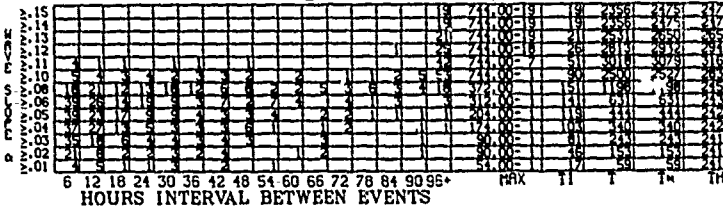


# OCTOBER

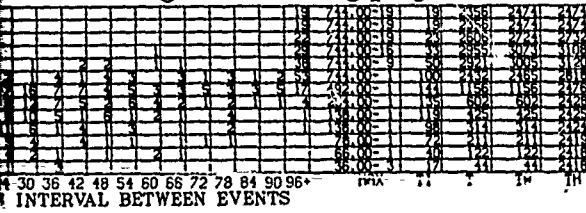
2 37-3



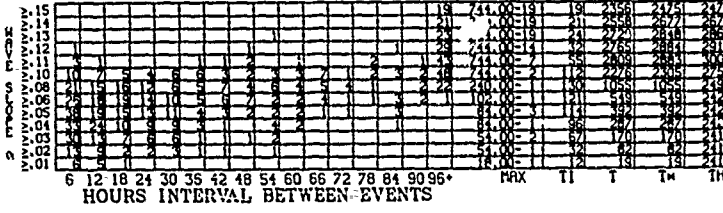
3 62-3



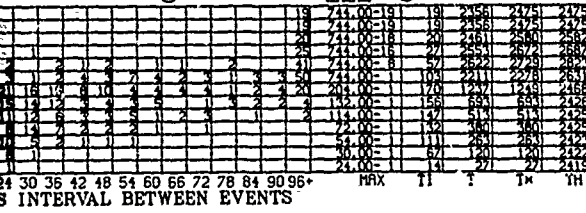
5 84-3



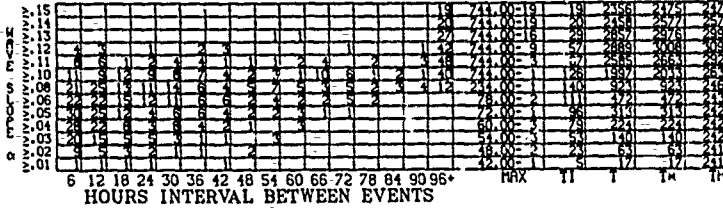
6 107-3



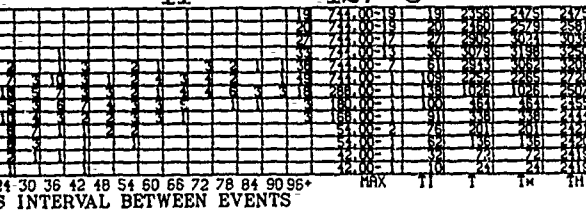
8 111-3



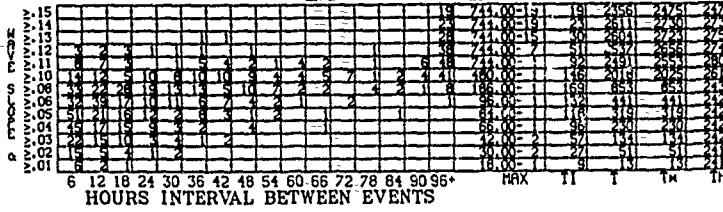
9 129-3



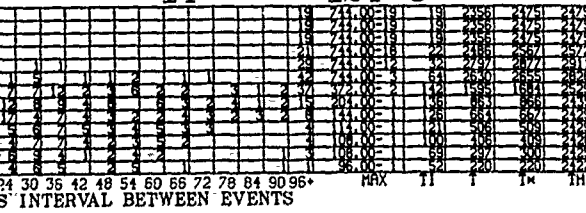
11 127-3



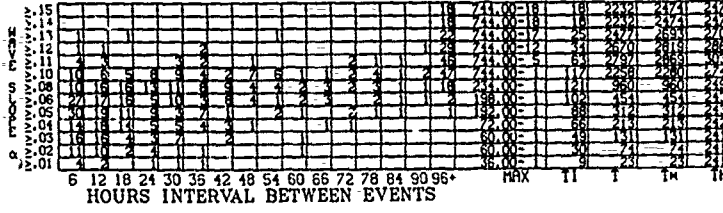
12 132-3



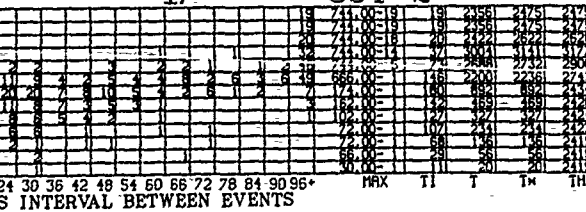
14 124-3



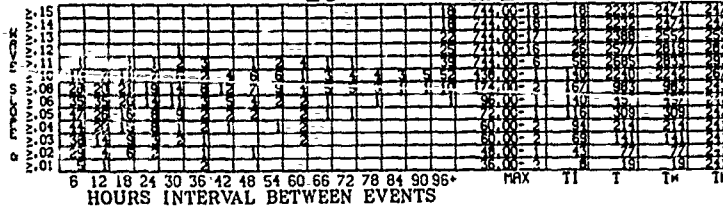
15 147-3



17 304-2



18 171-3

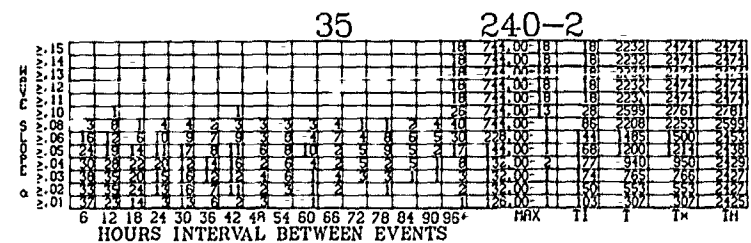
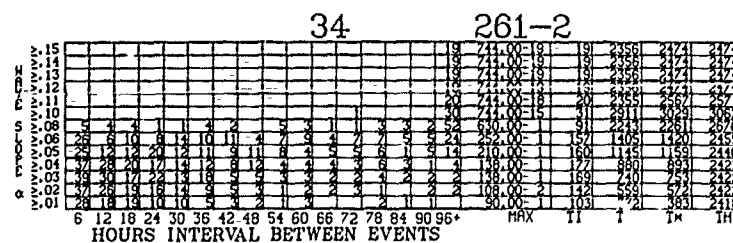
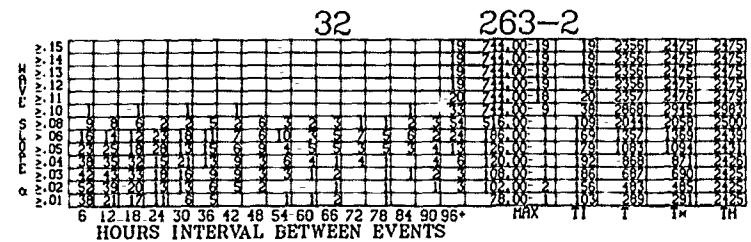
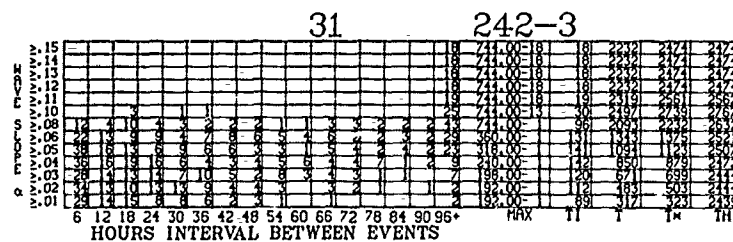
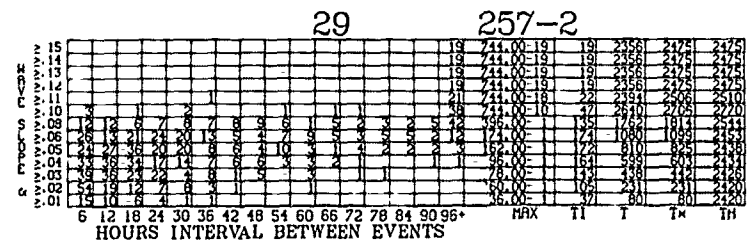
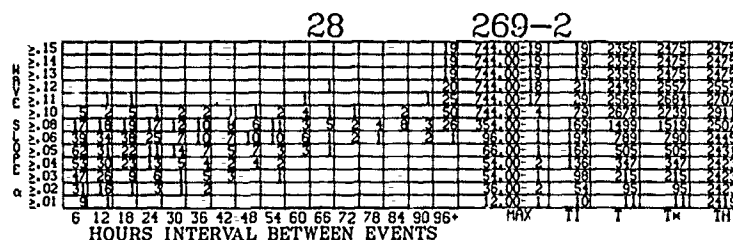
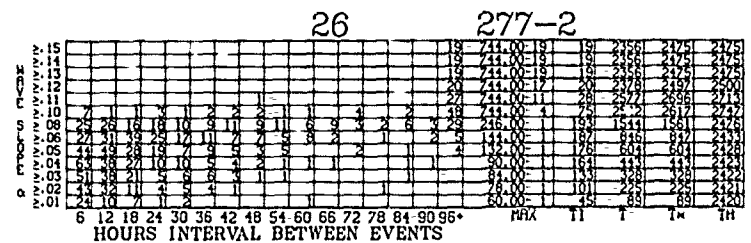
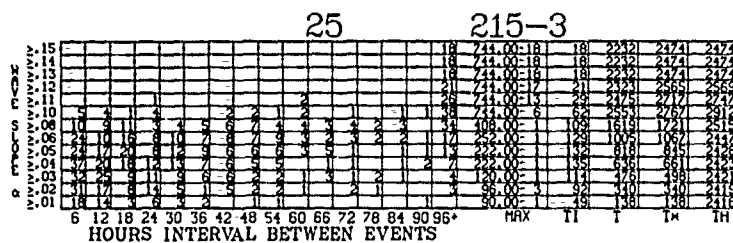
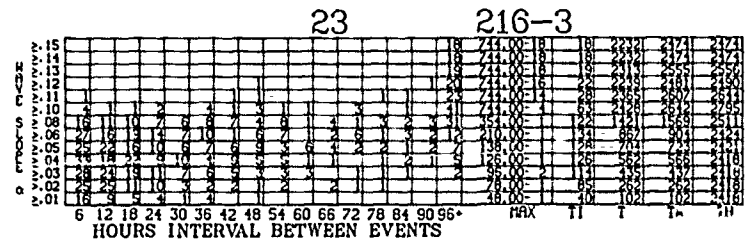
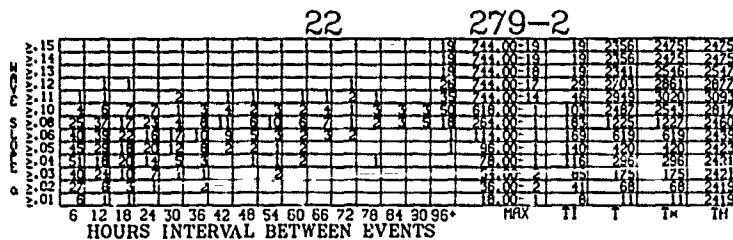
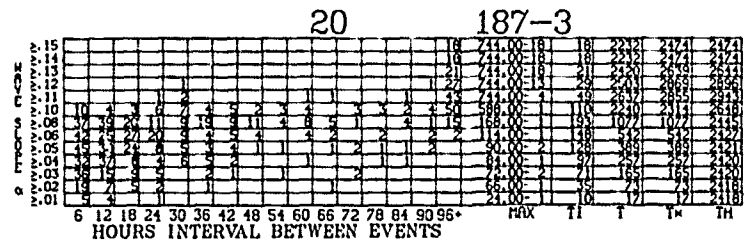
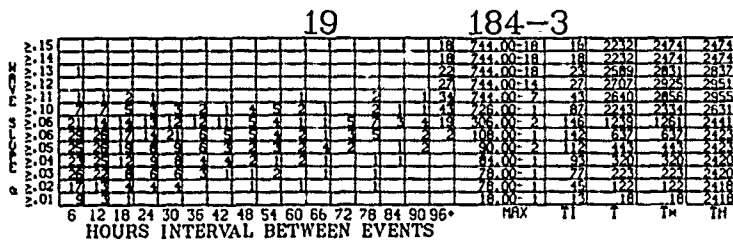


(2)

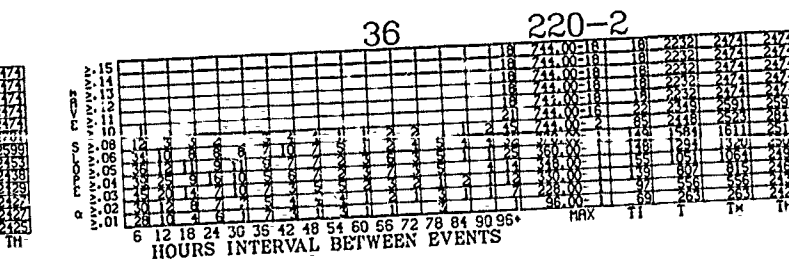
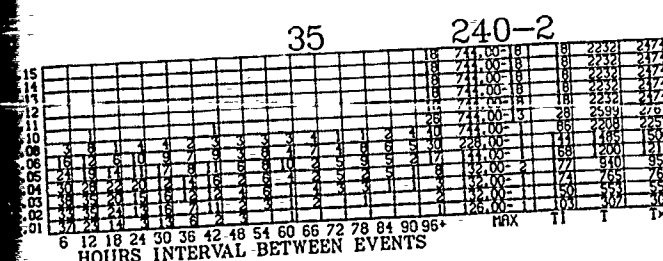
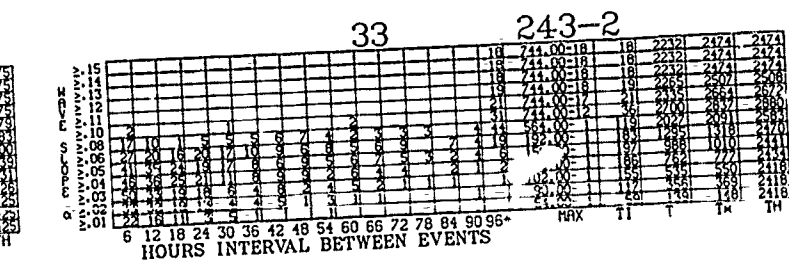
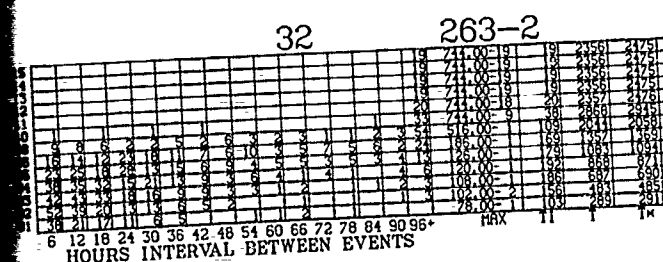
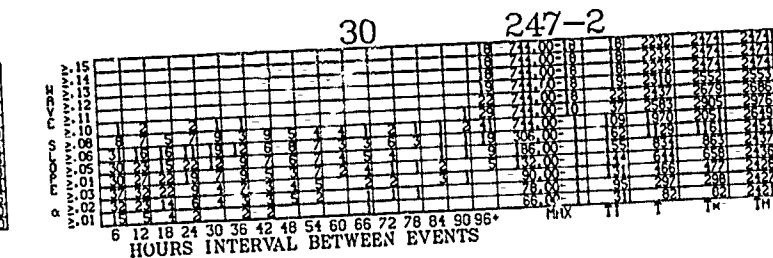
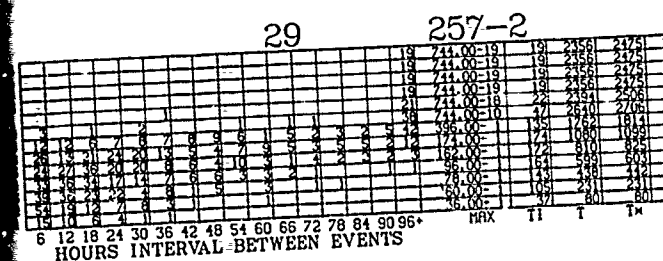
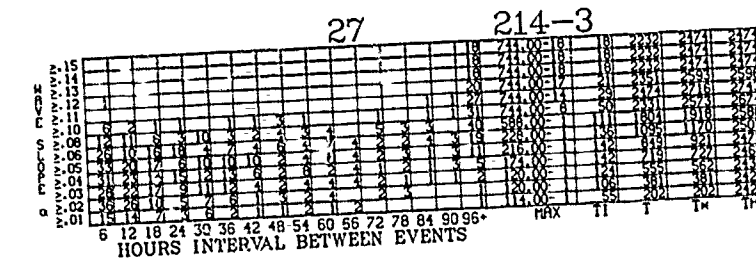
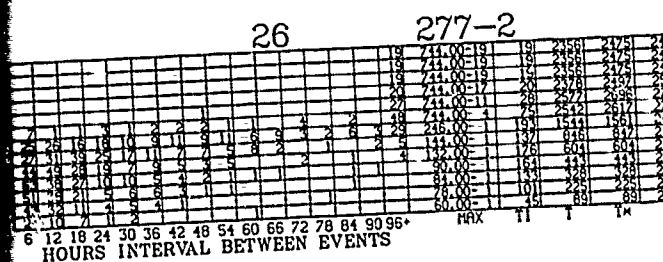
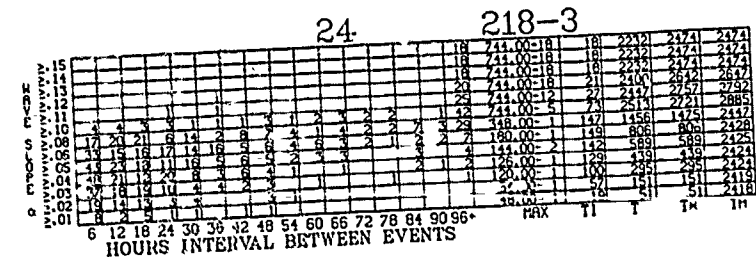
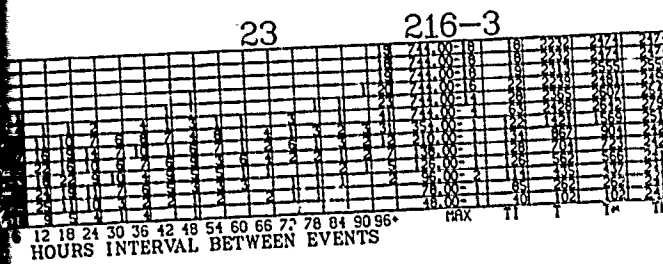
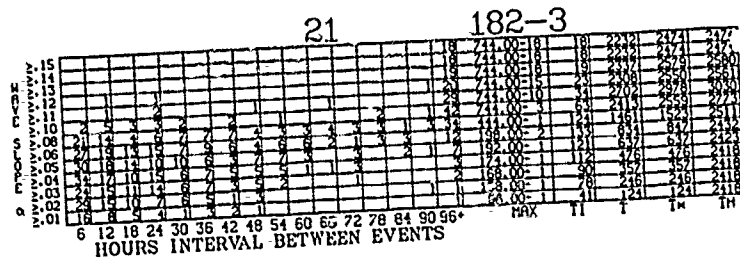
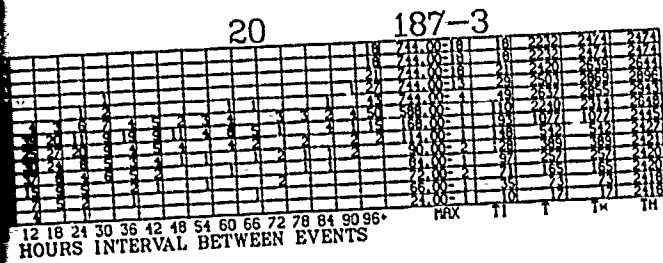


# OCTOBER

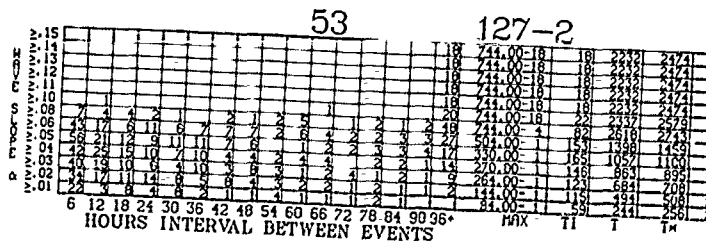
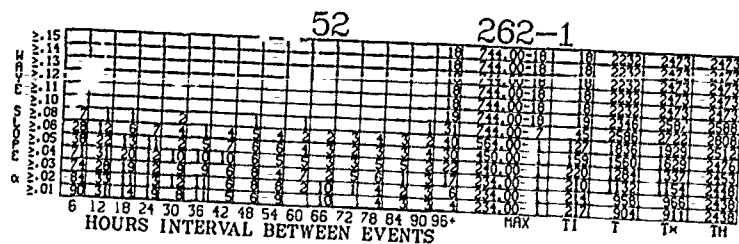
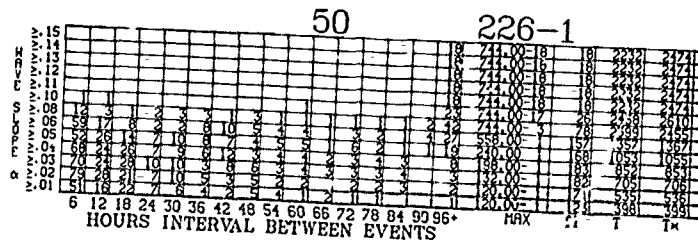
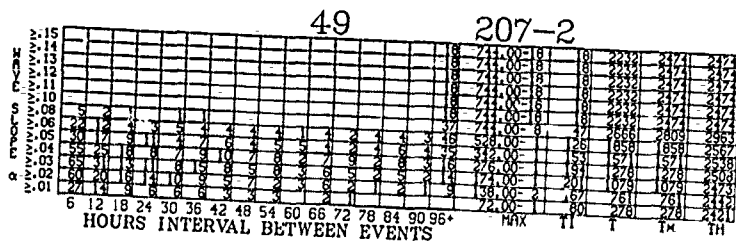
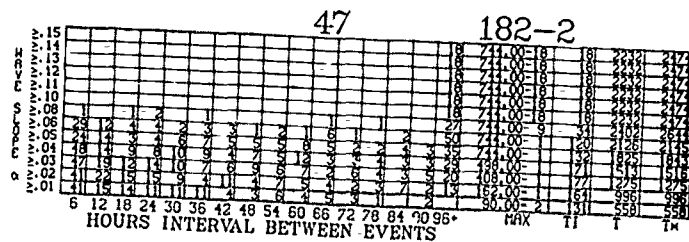
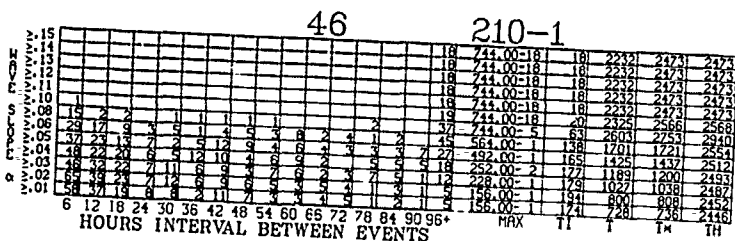
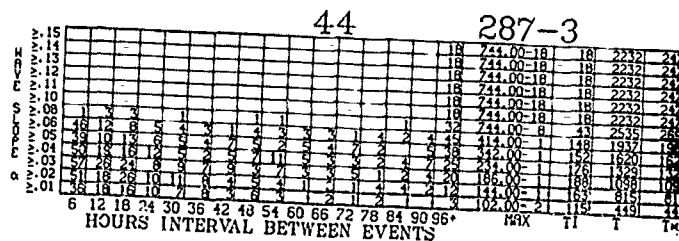
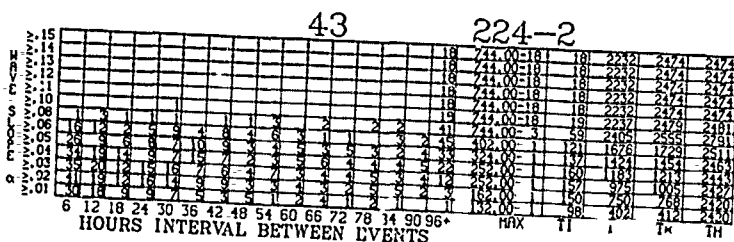
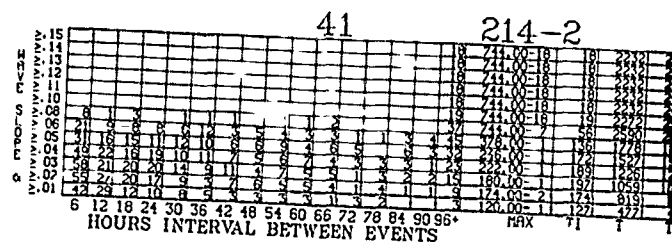
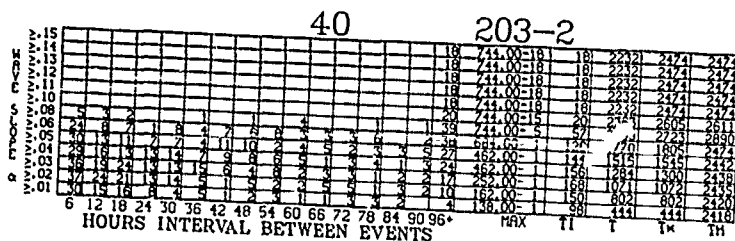
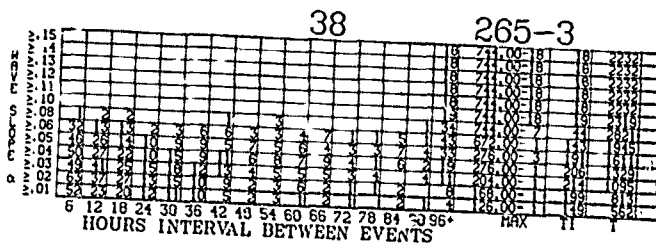
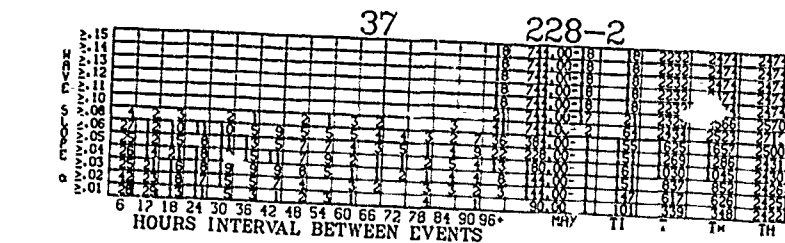
# WAVE



# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)



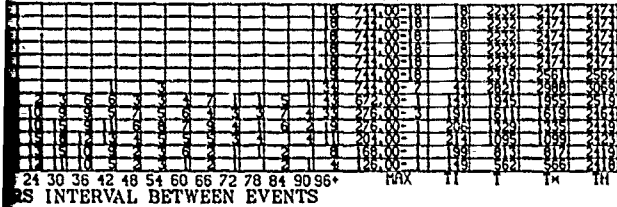
# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)



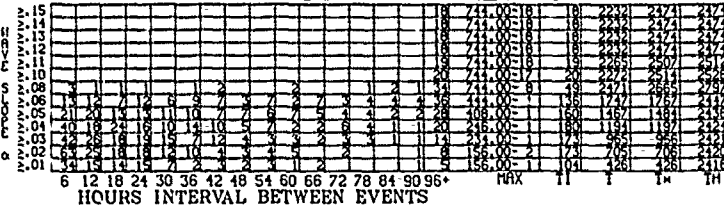
⑦

# OCTOBER

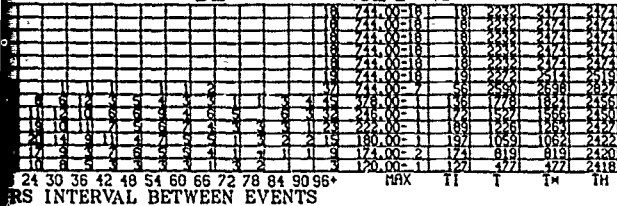
38 265-3



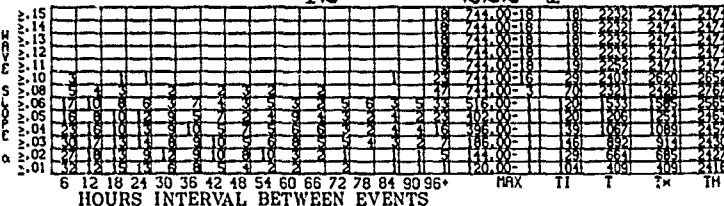
39 216-2



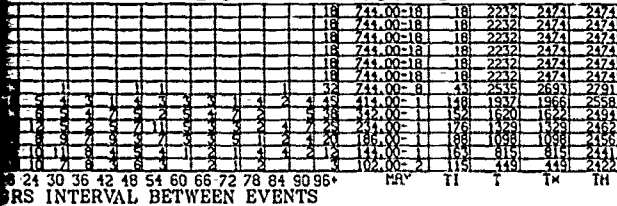
41 214-2



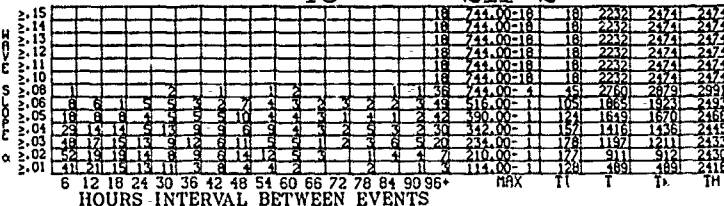
42 222-1



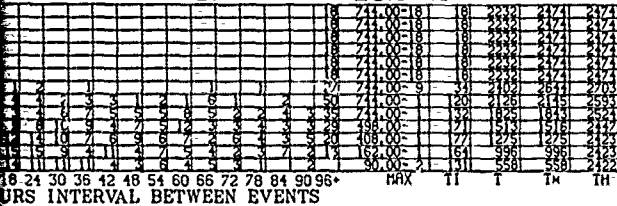
44 287-3



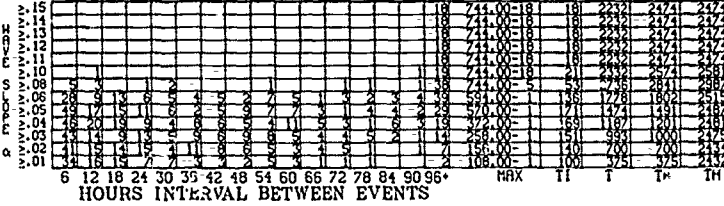
45 211-2



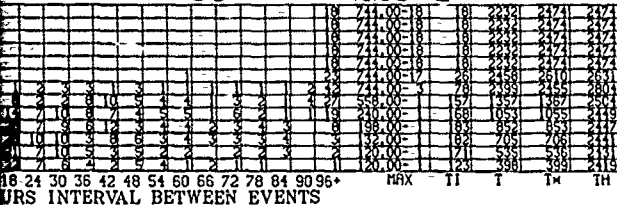
47 182-2



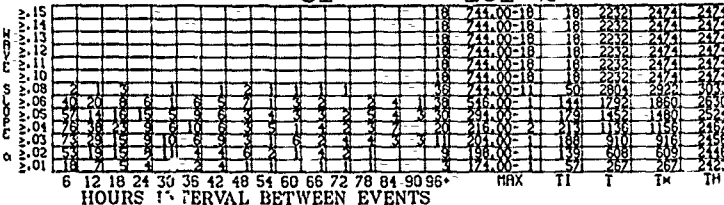
48 151-2



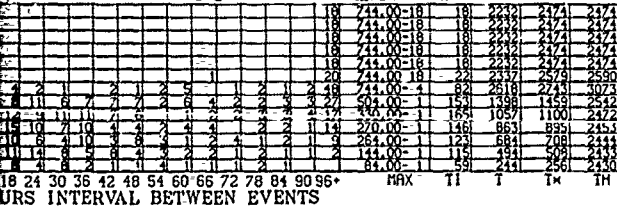
50 226-1



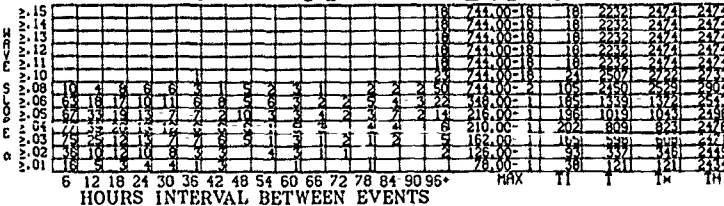
51 161-2



53 127-2

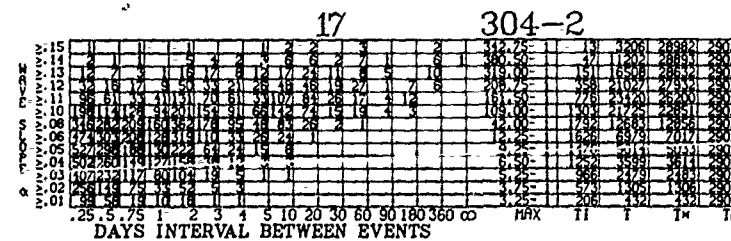
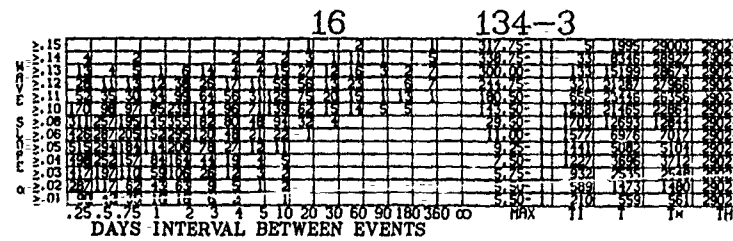
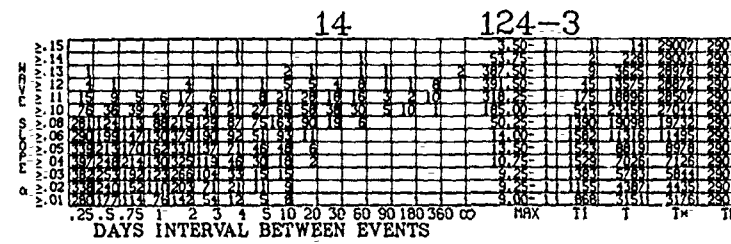
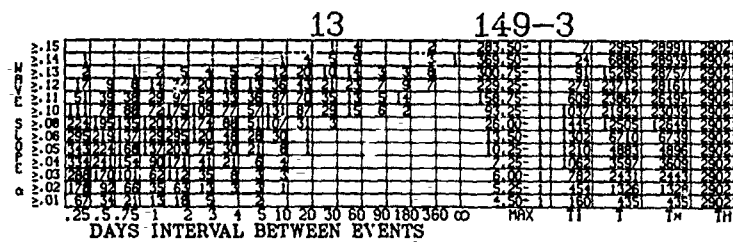
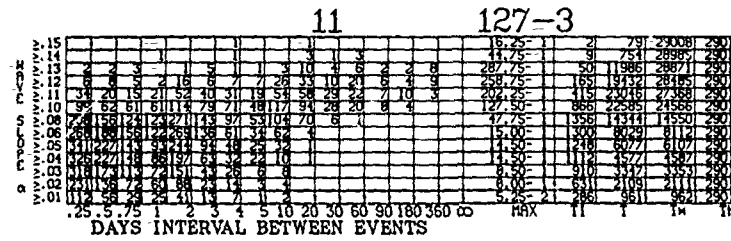
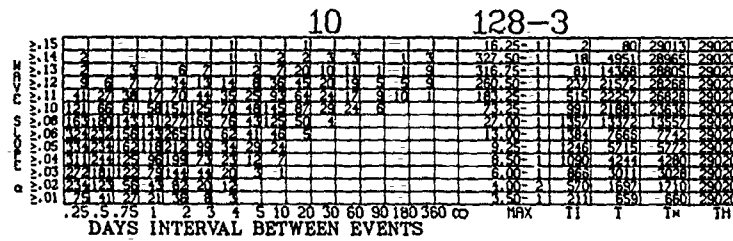
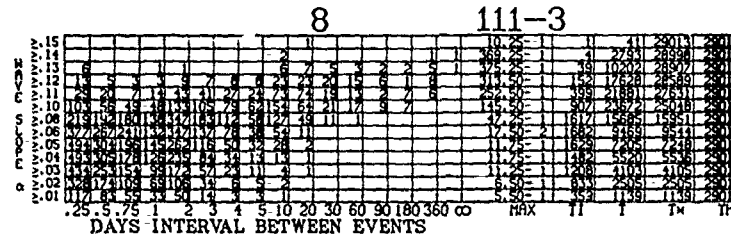
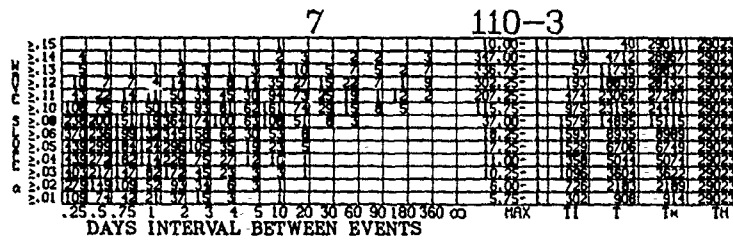
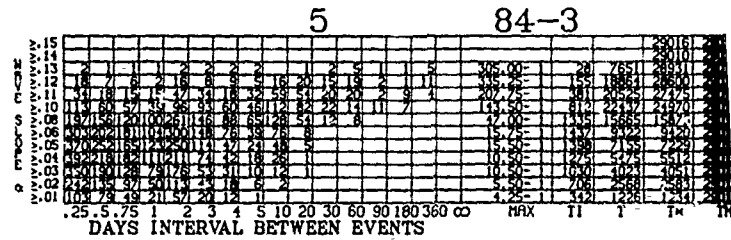
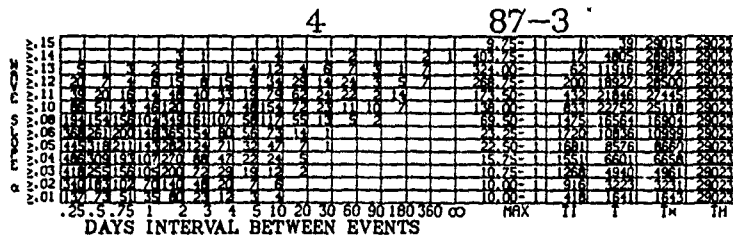
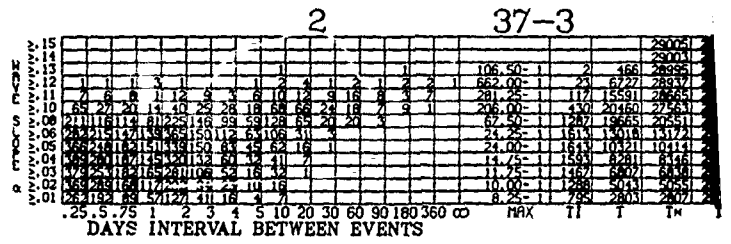
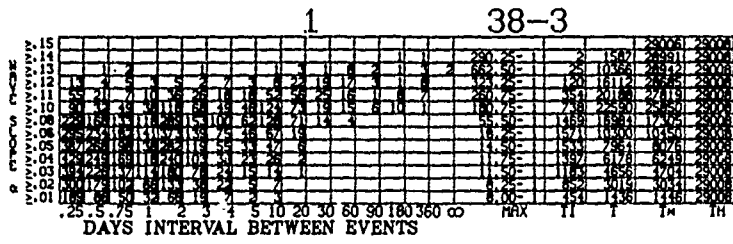


54 124-2

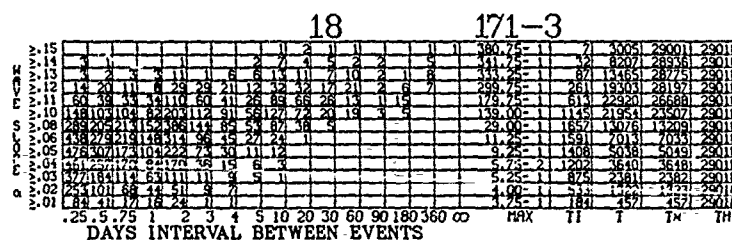
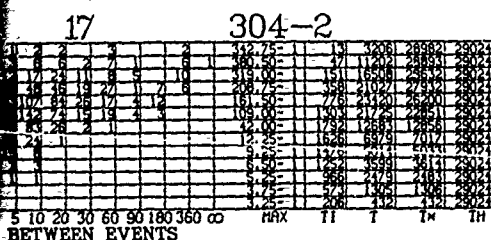
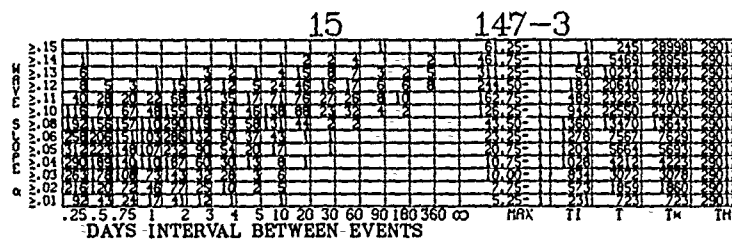
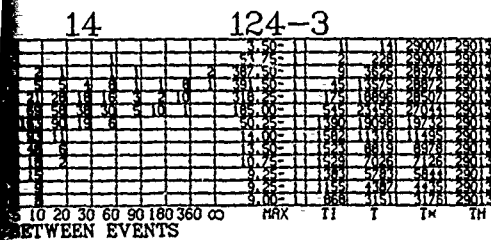
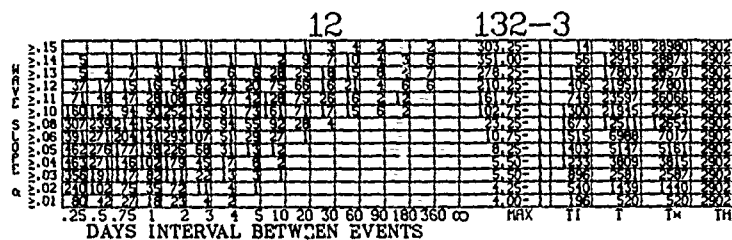
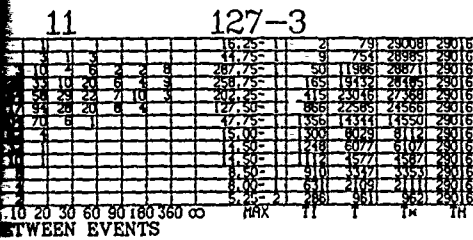
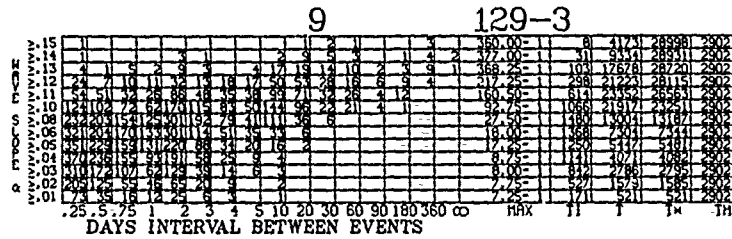
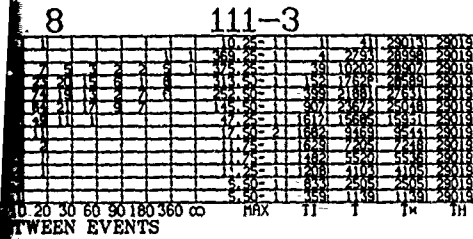
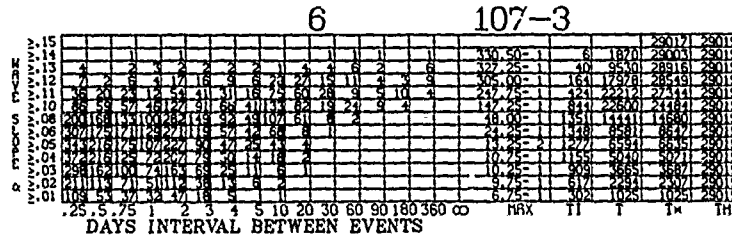
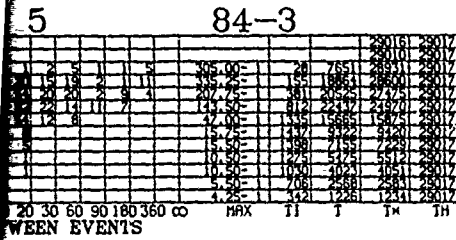
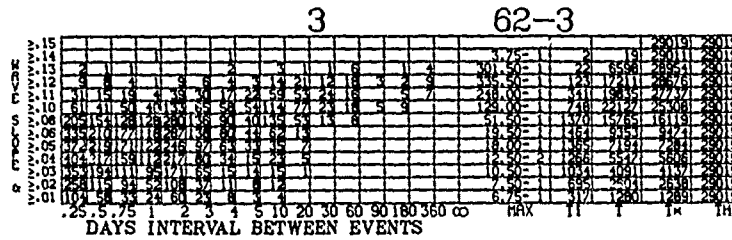
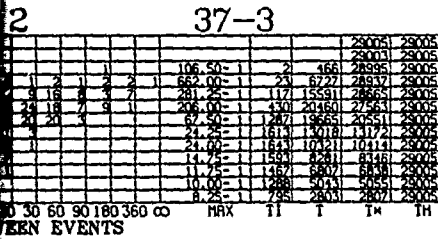




ALL DAYS

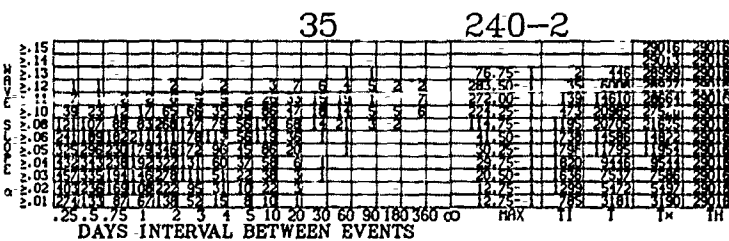
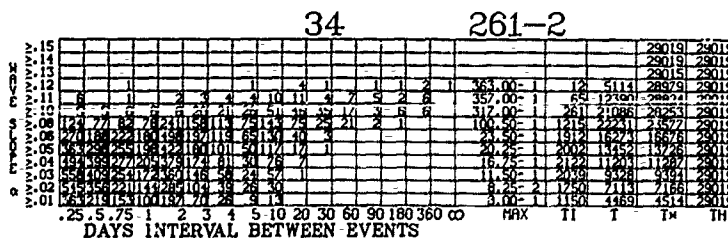
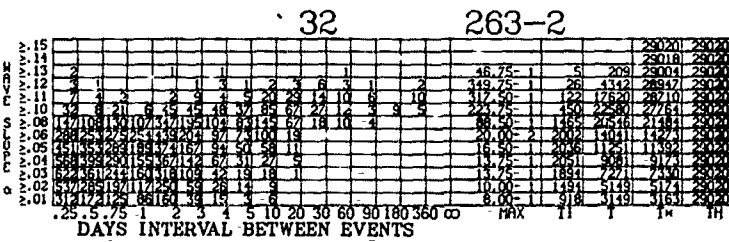
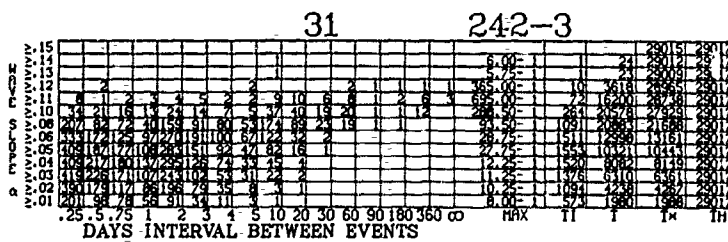
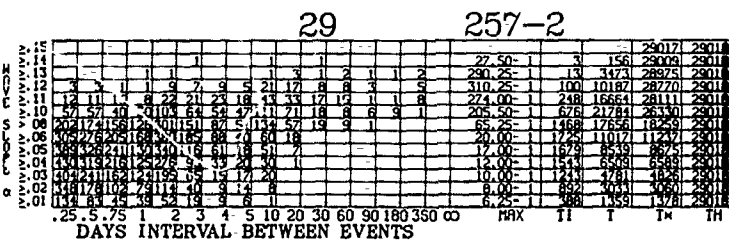
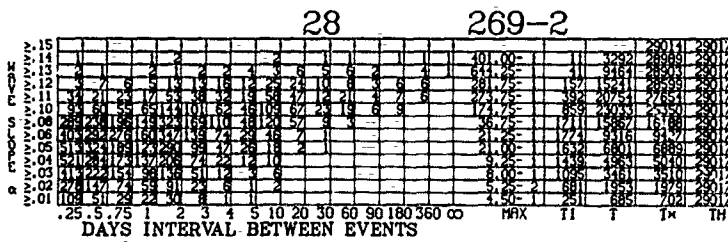
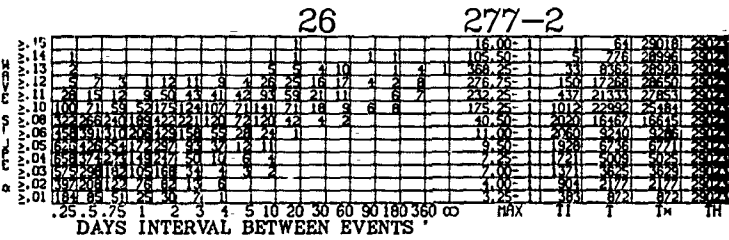
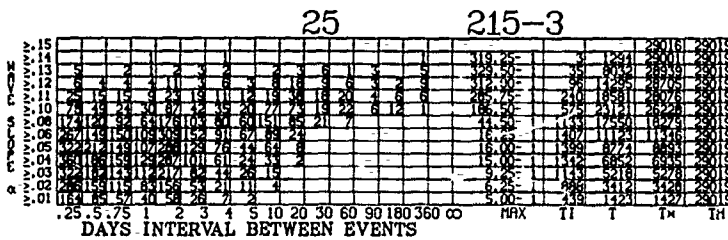
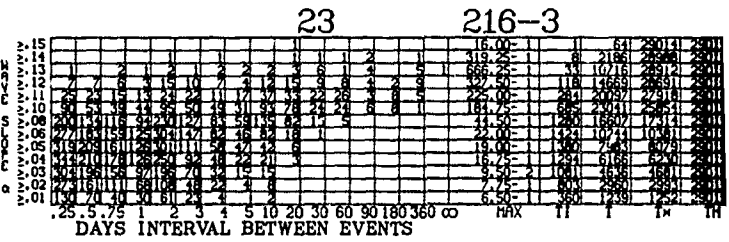
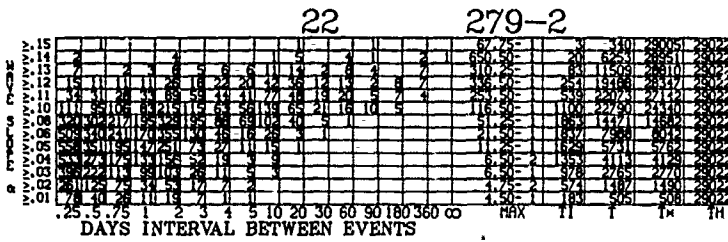
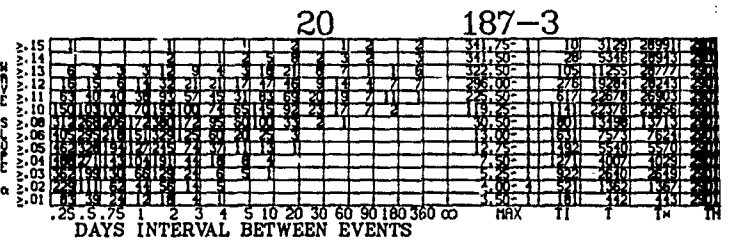
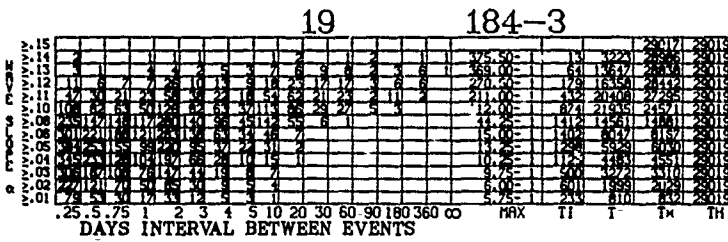


# WAVE SLOPE ( $\alpha$ ) INTERVALS





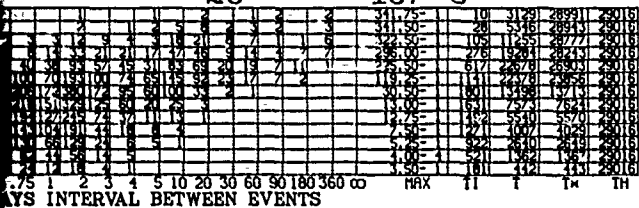
# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)



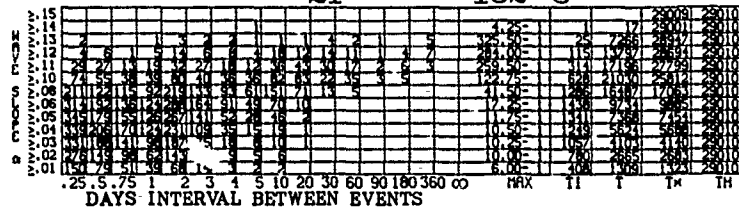
0

# ALL DAYS

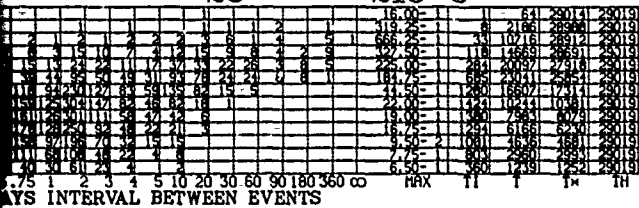
20 187-3



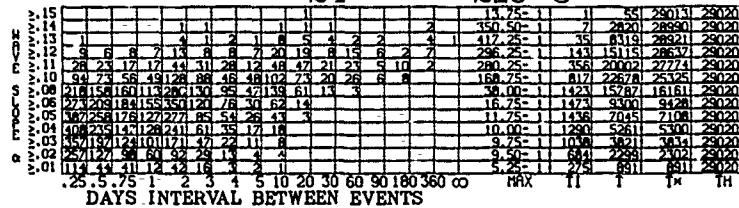
21 182-3



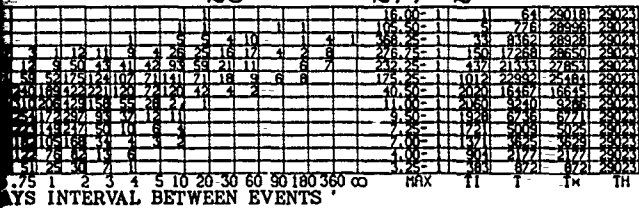
23 216-3



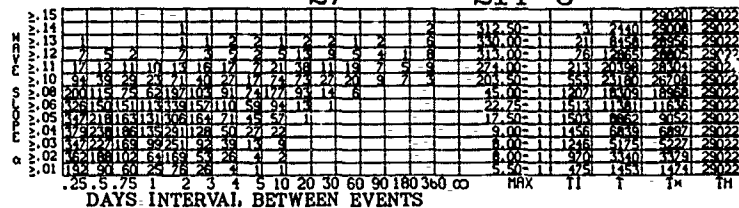
24 218-3



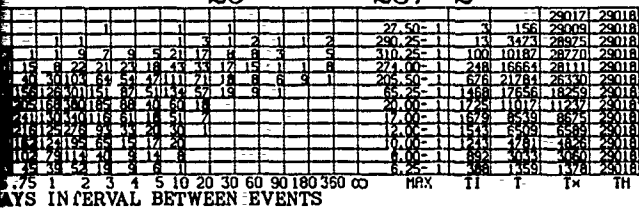
26 277-2



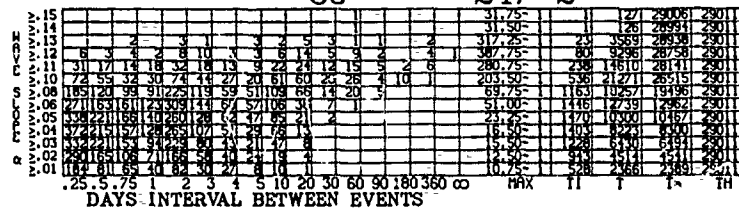
27 214-3



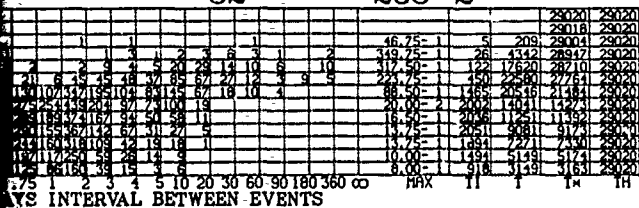
29 257-2



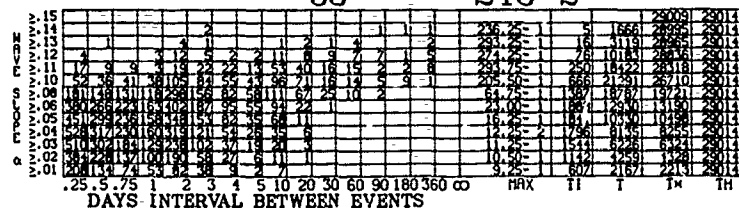
30 247-2



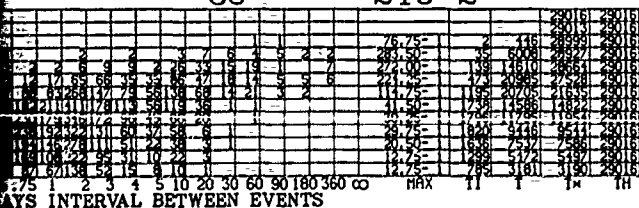
32 263-2



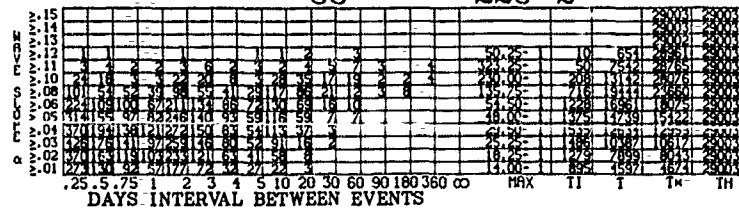
33 243-2



35 240-2

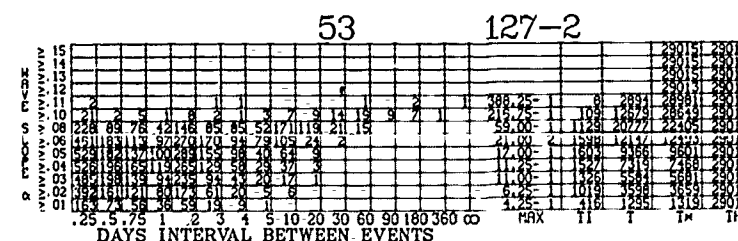
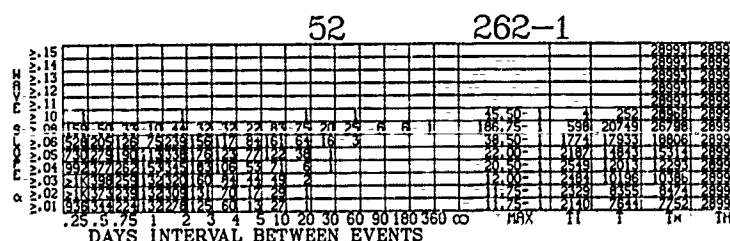
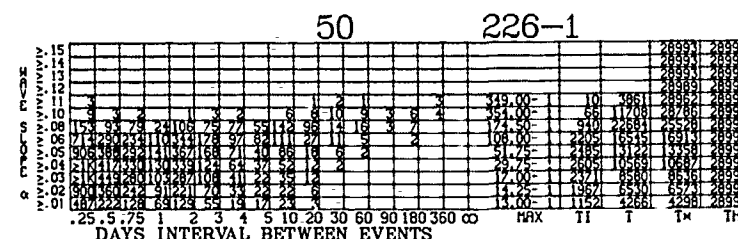
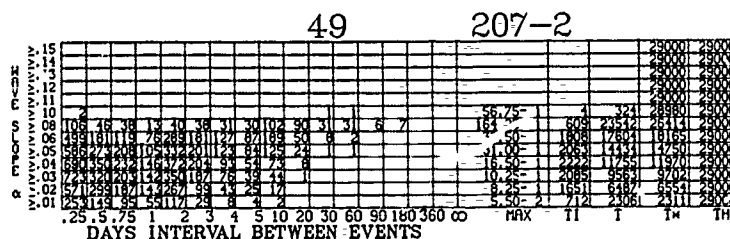
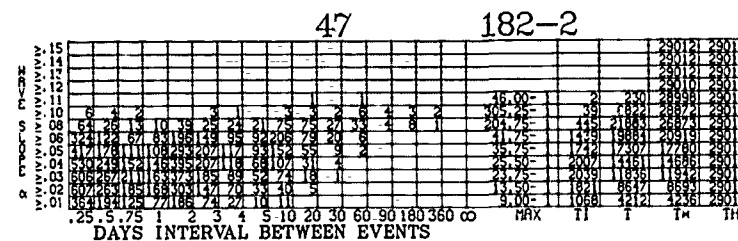
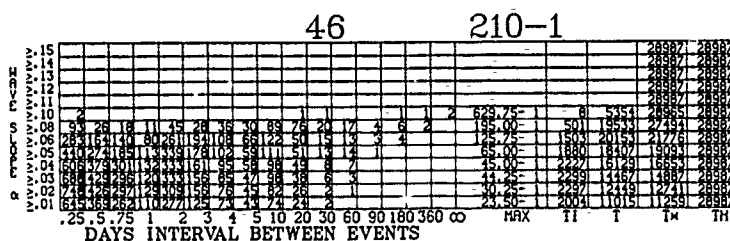
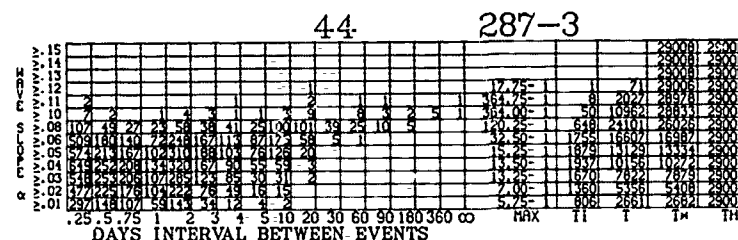
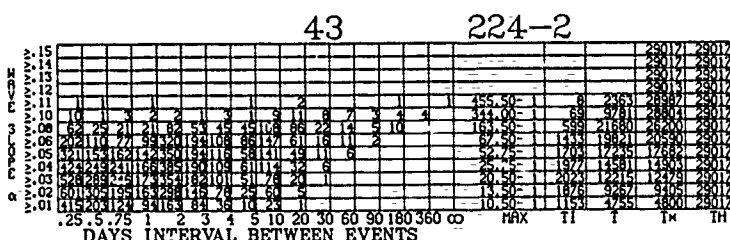
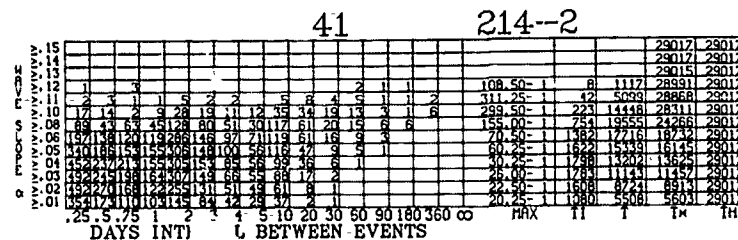
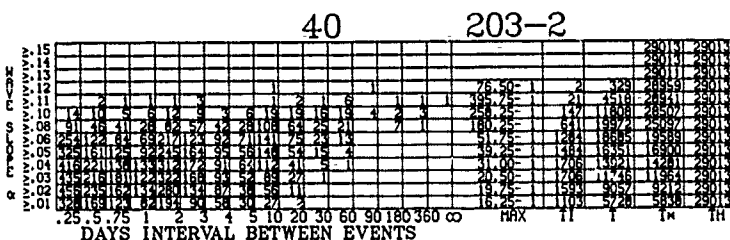
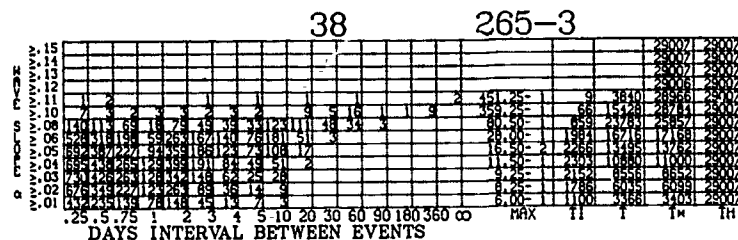
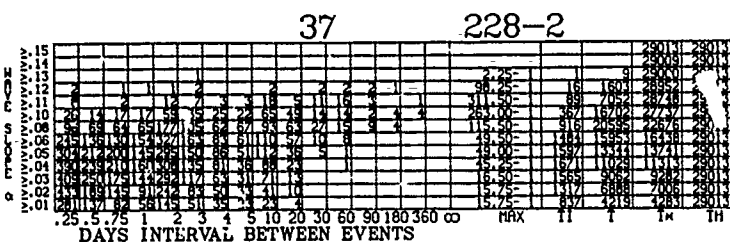


36 220-2



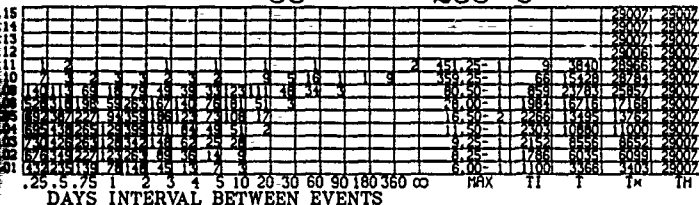
# ALL DAYS

# WAVE

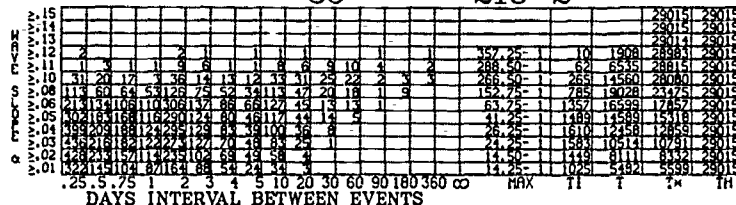


# WAVE SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

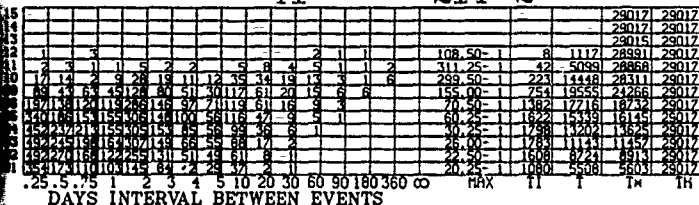
38 265-3



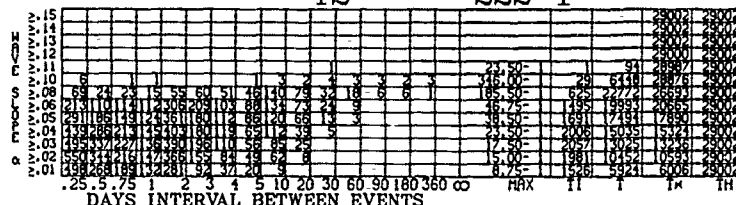
39 216-2



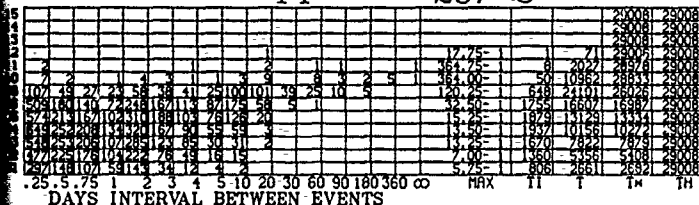
41 214-2



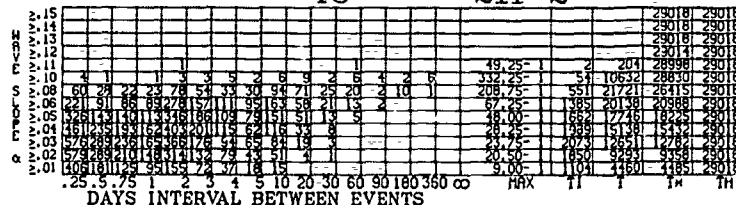
42 222-1



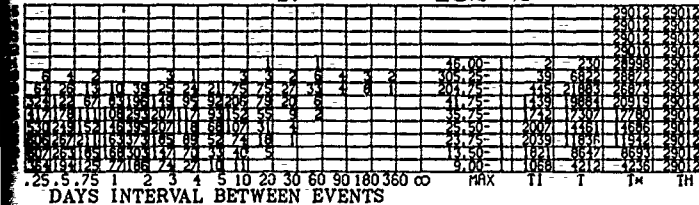
44 287-3



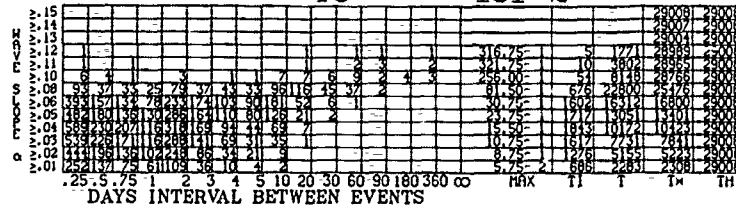
45 211-2



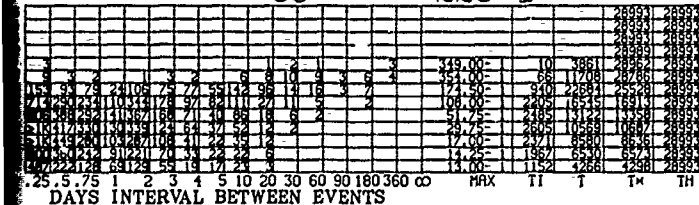
47 182-2



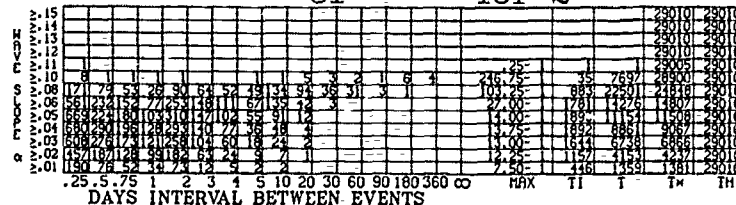
48 151-2



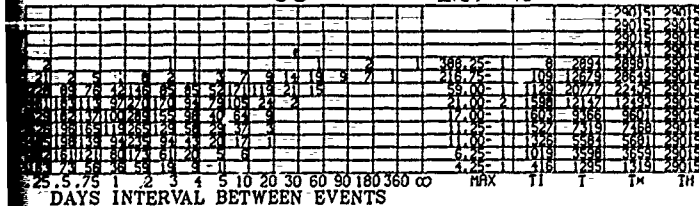
50 226-1



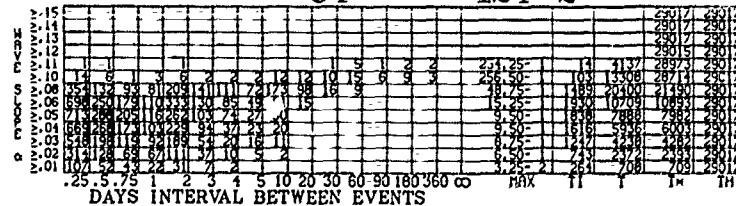
51 161-2



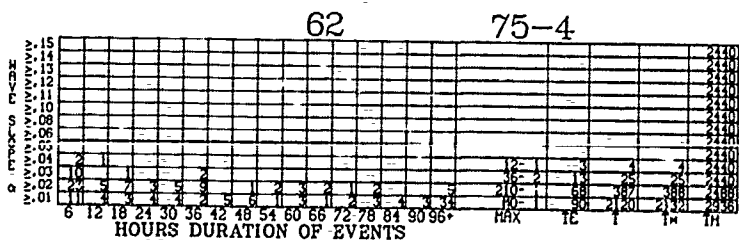
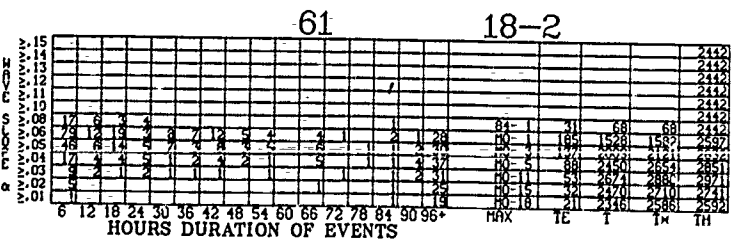
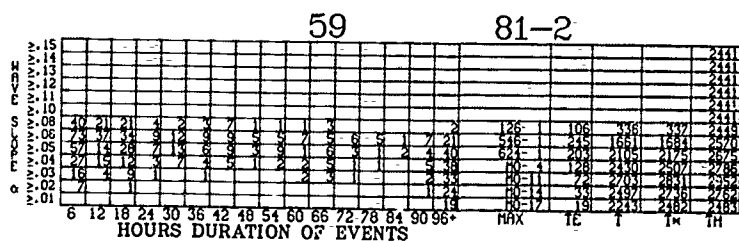
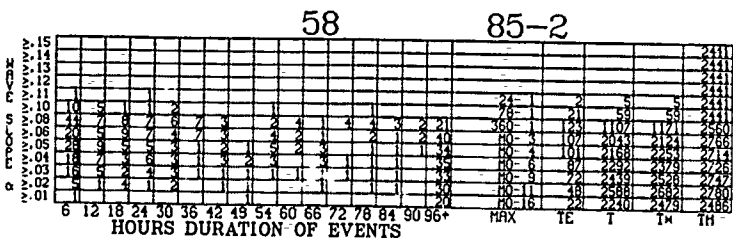
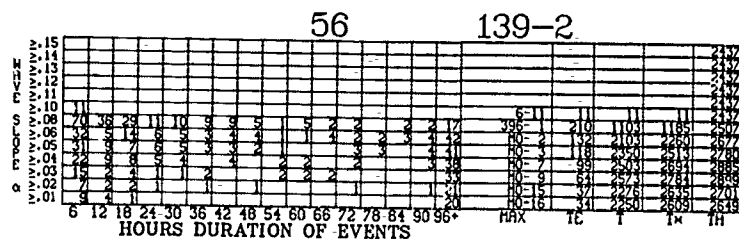
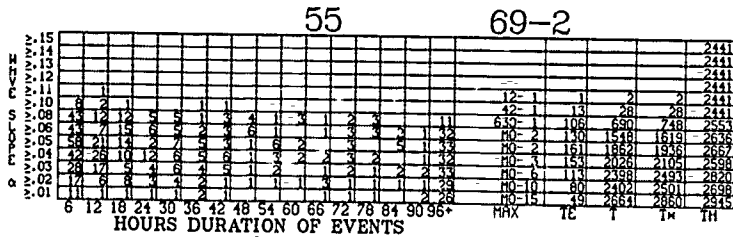
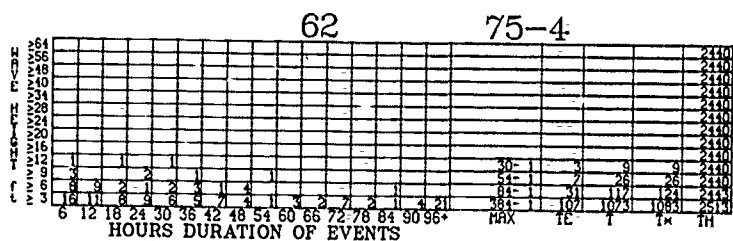
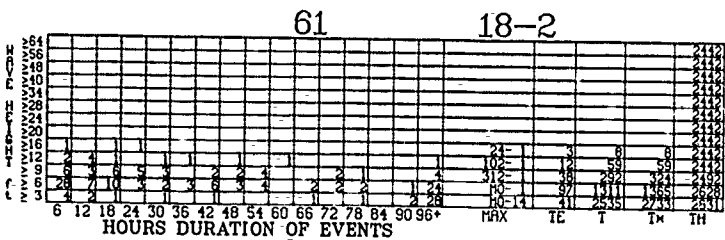
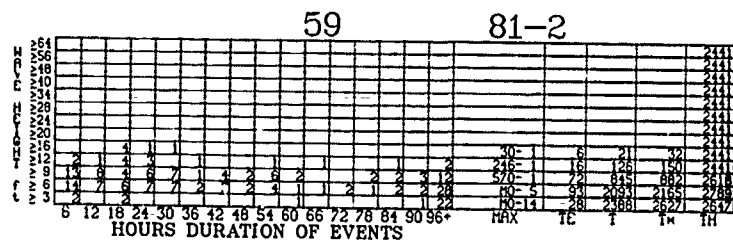
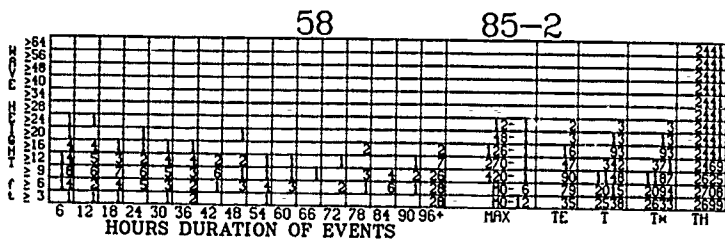
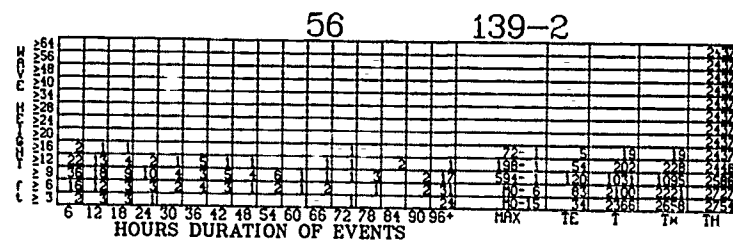
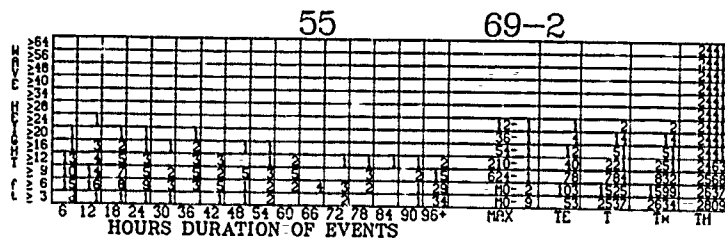
53 127-2



54 124-2



# WAVE HEIGHT AND SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



17

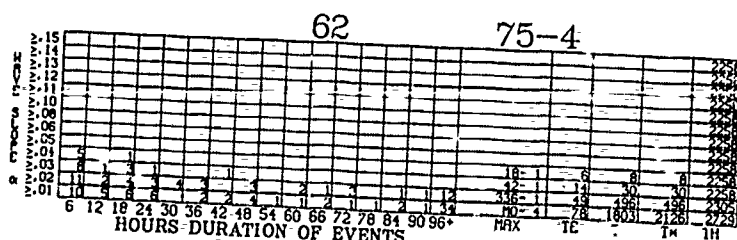
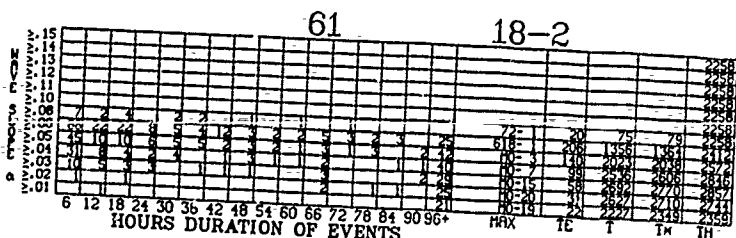
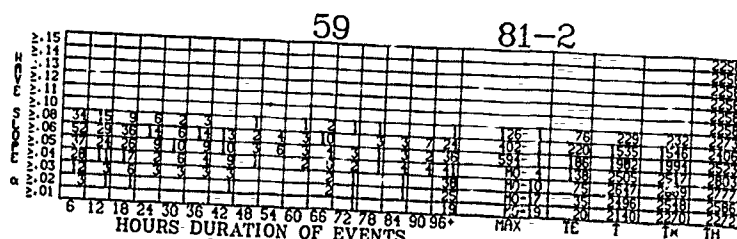
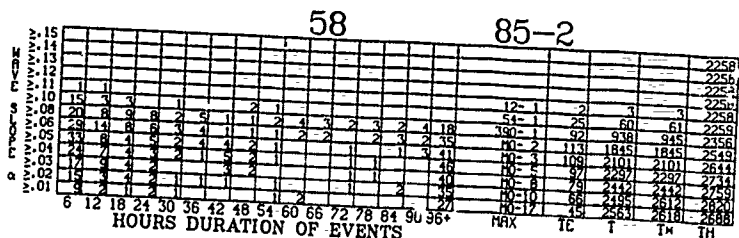
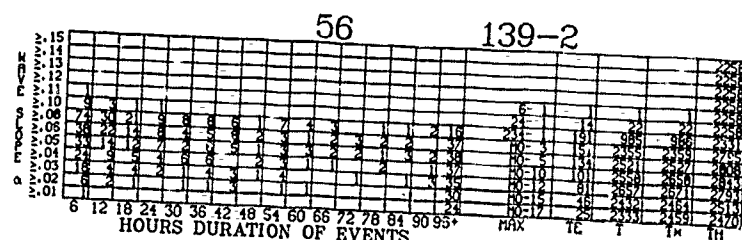
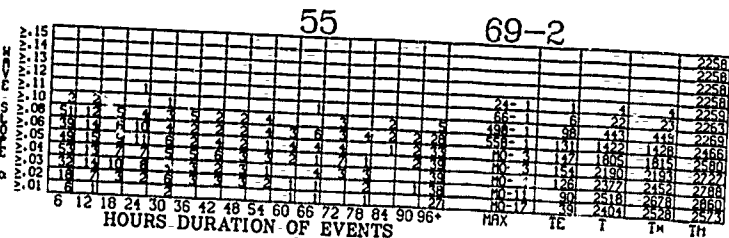
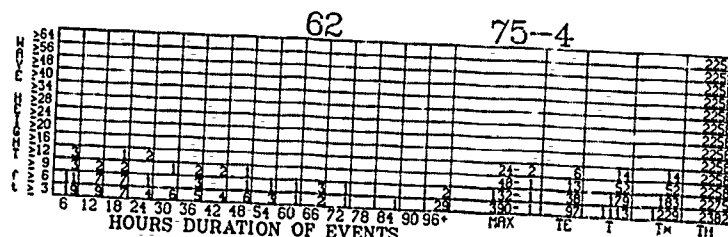
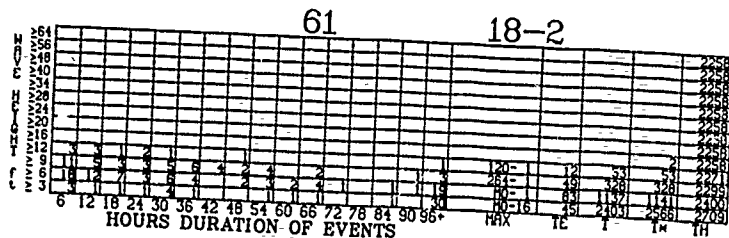
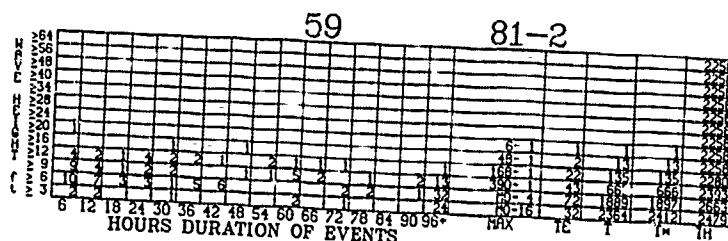
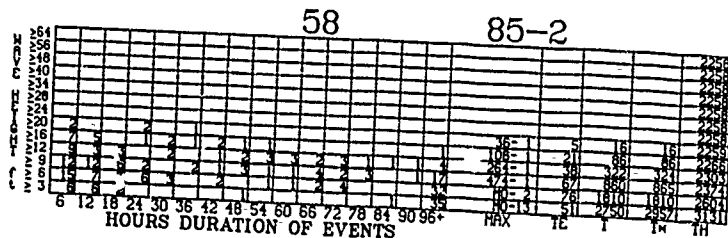
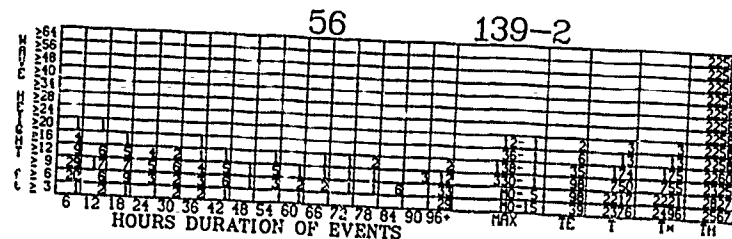
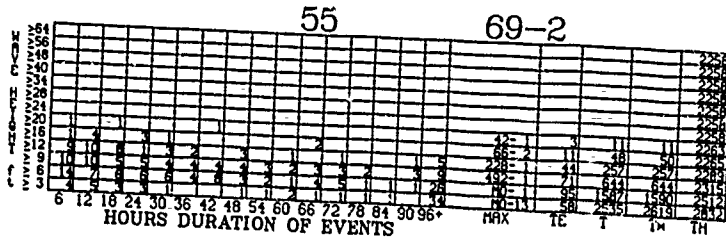






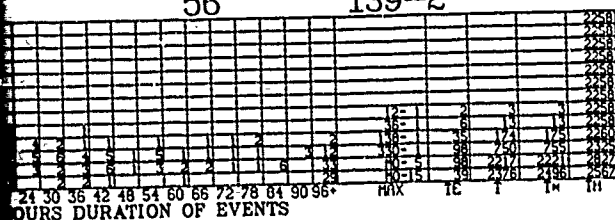
# FEBRUARY

# WAVE HEIGHT AND S

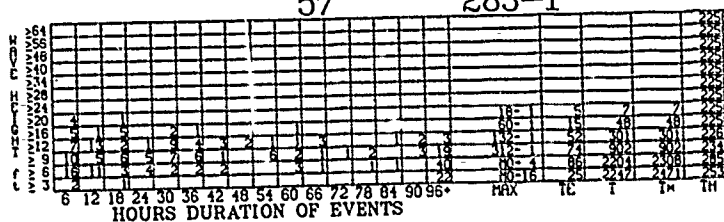


# WAVE HEIGHT AND SLOPE ( $\alpha$ ) DURATIONS (Cont'd)

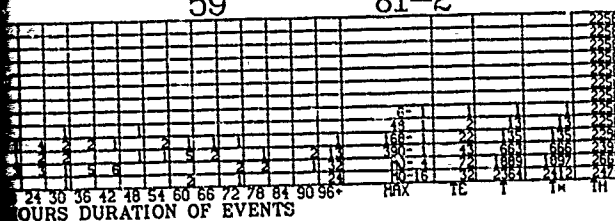
56 139-2



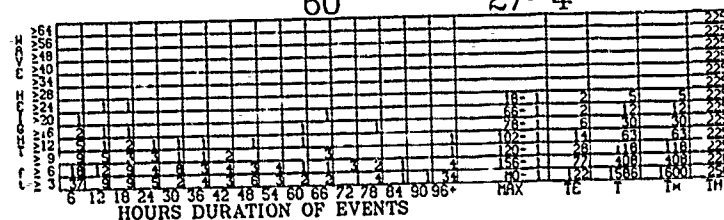
57 283-1



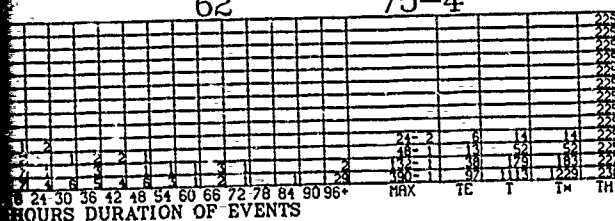
59 81-2



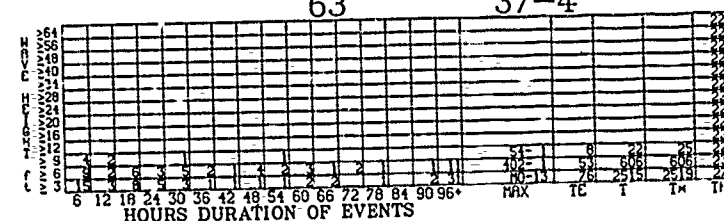
60 27-4



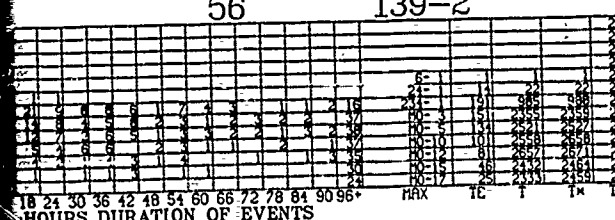
62 75-4



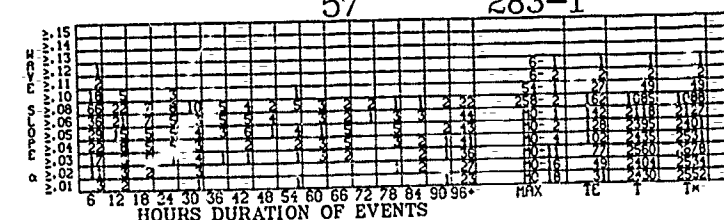
63 37-4



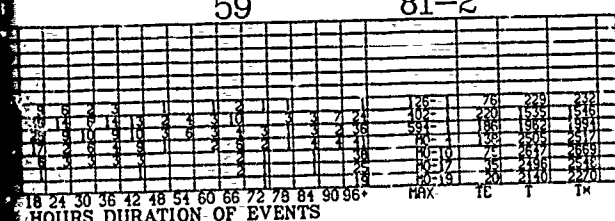
56 139-2



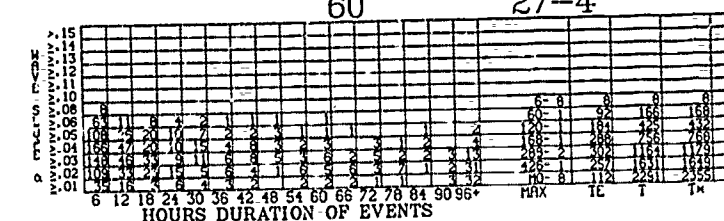
57 283-1



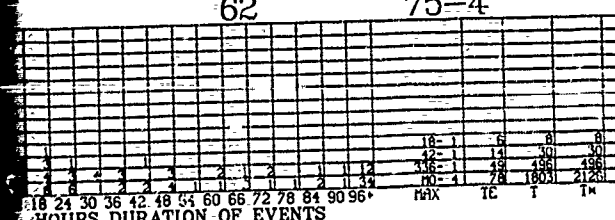
59 81-2



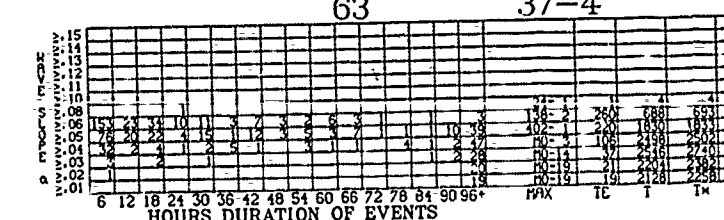
60 27-4



62 75-4

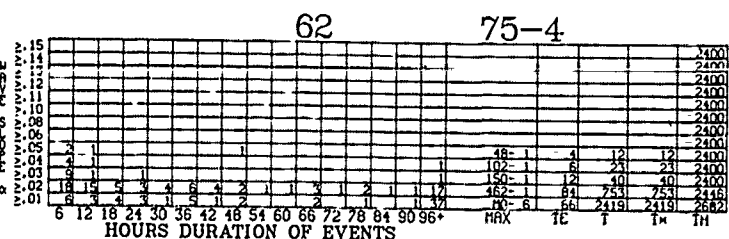
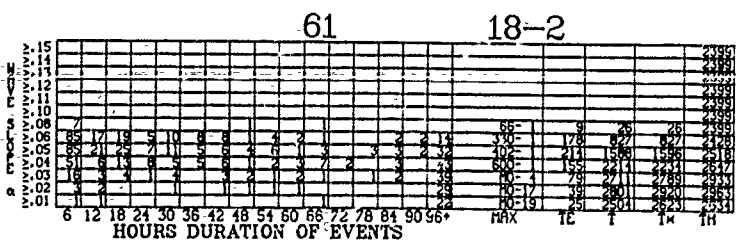
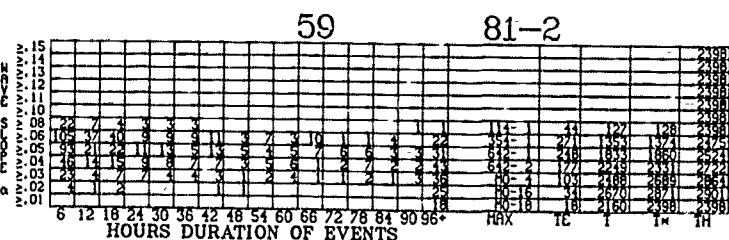
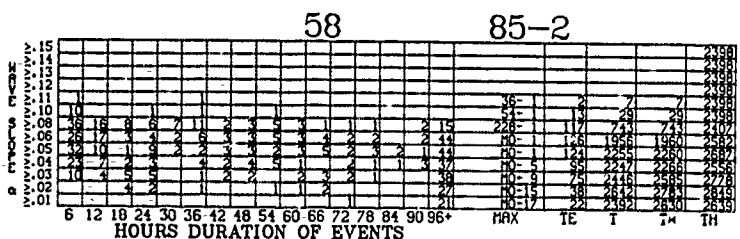
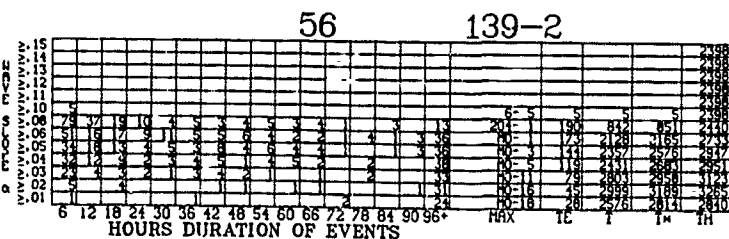
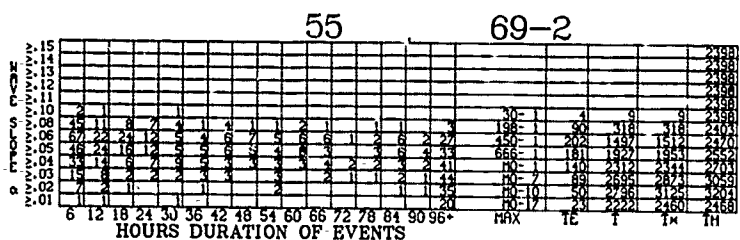
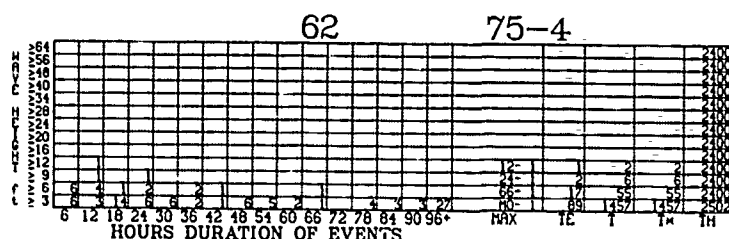
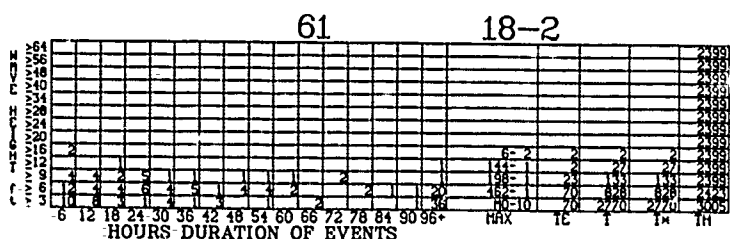
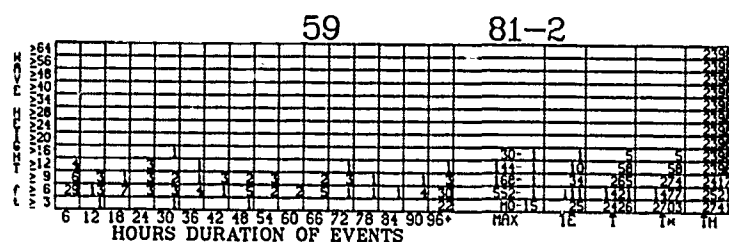
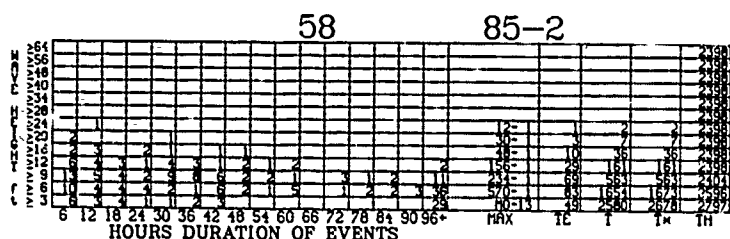
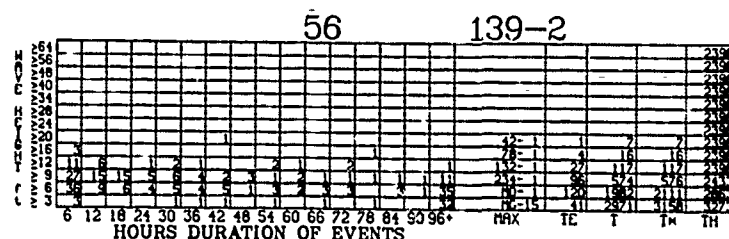
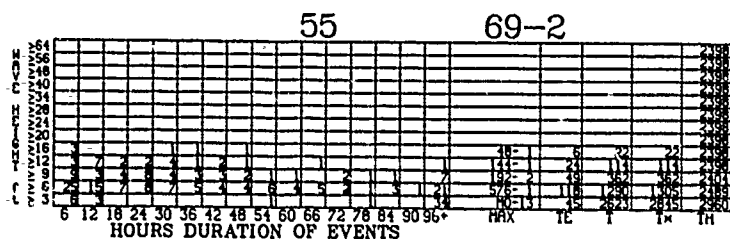


63 37-4



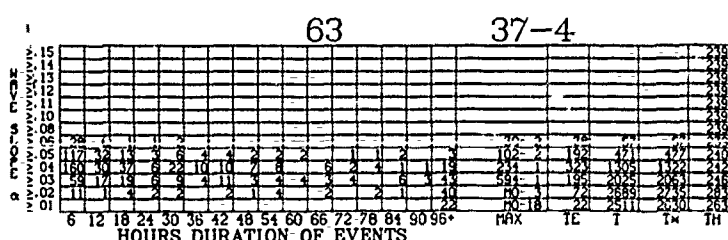
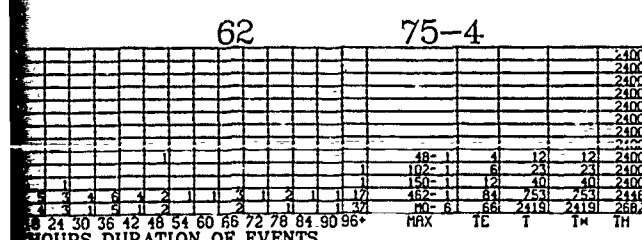
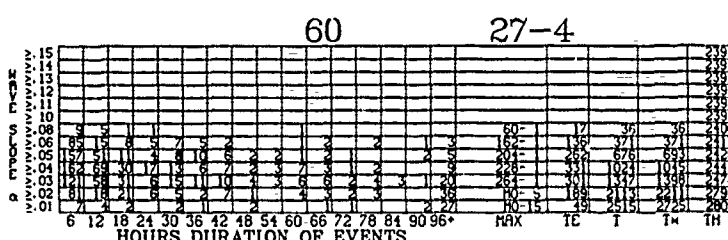
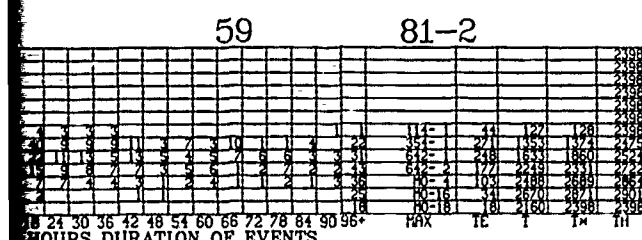
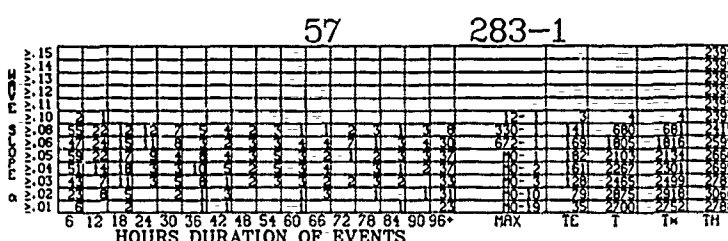
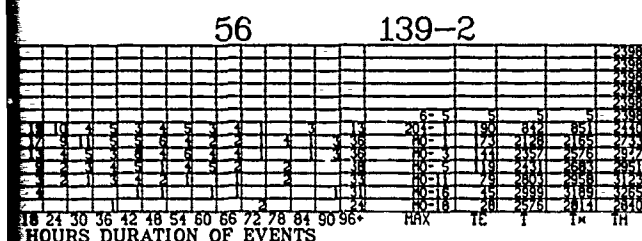
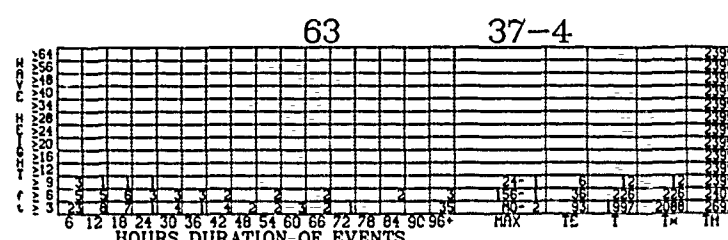
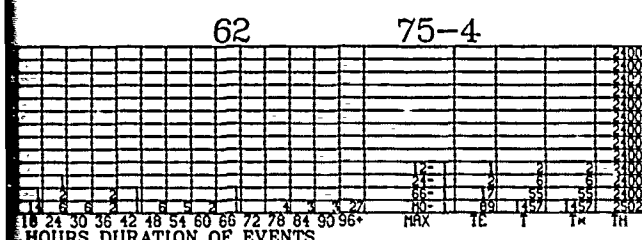
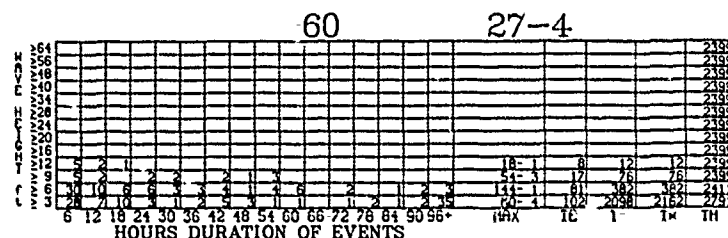
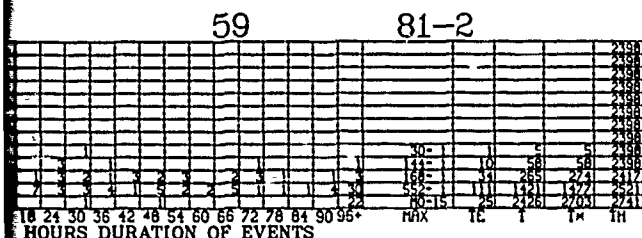
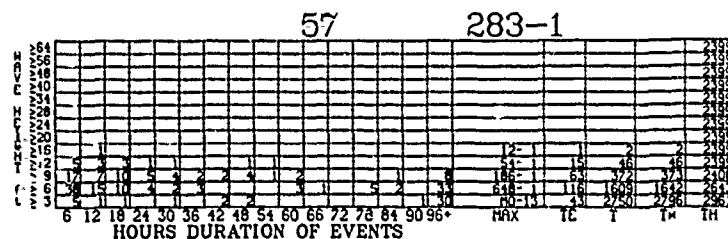
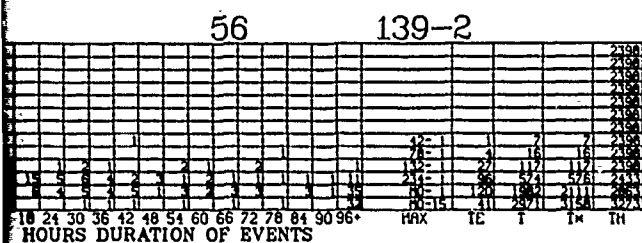
2

# WAVE HEIGHT AND SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



# RATIONS (Cont'd)

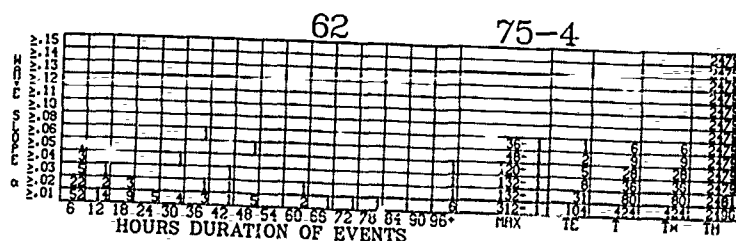
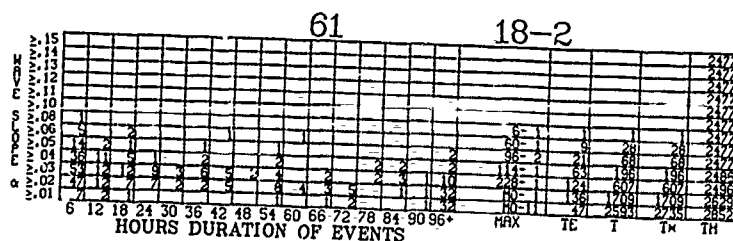
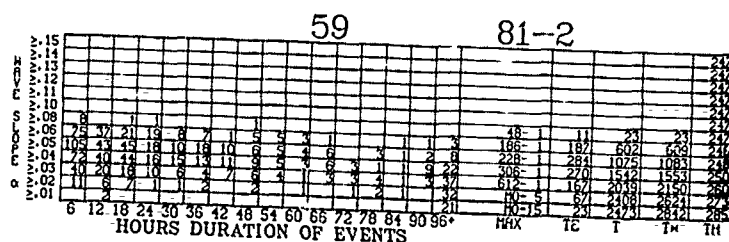
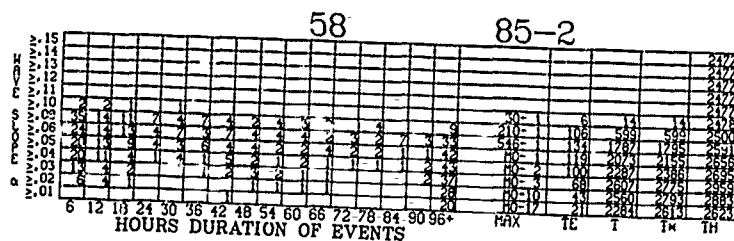
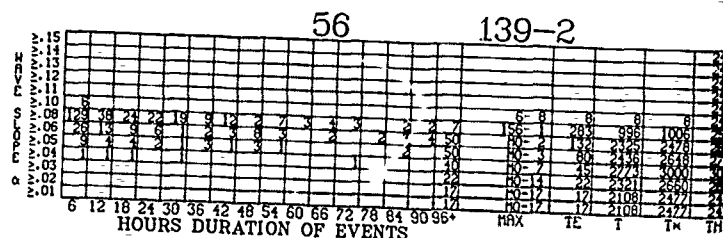
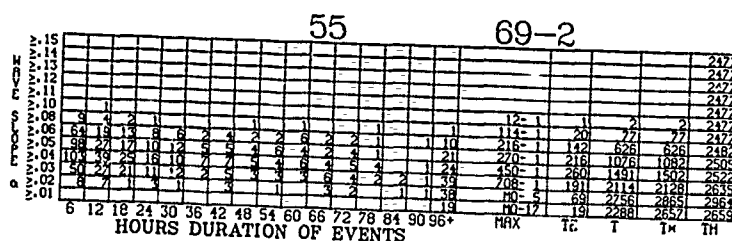
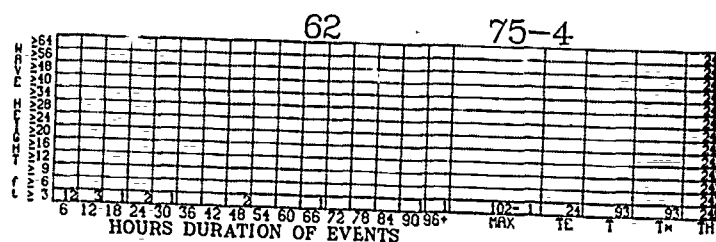
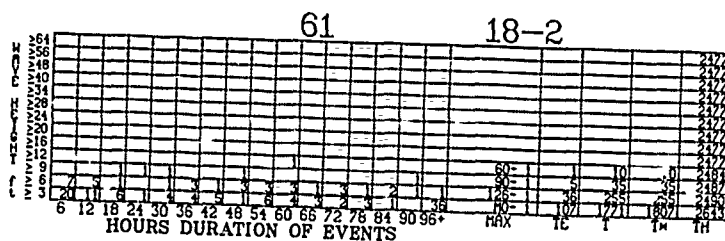
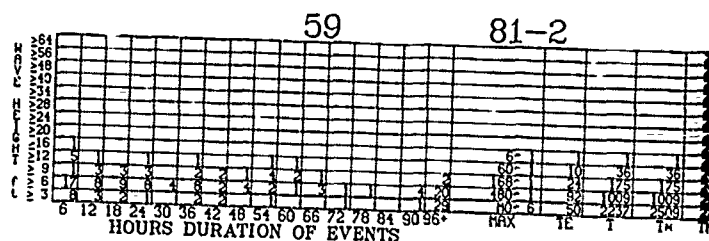
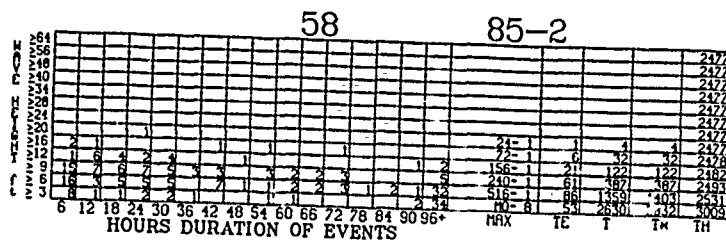
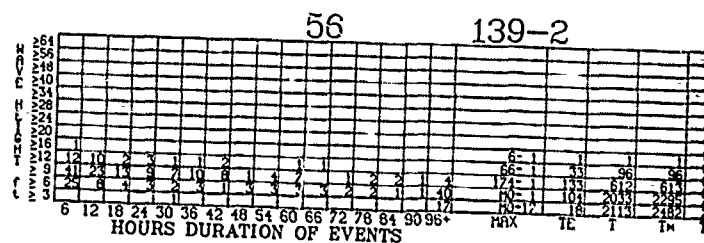
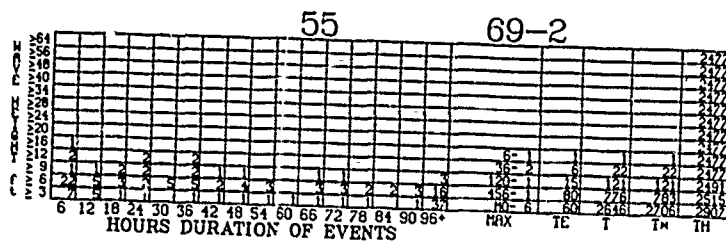
APRIL



②

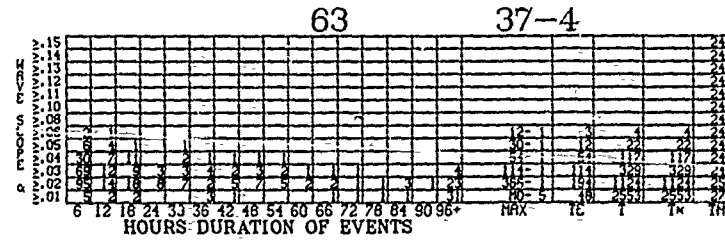
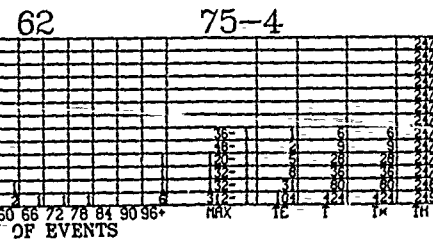
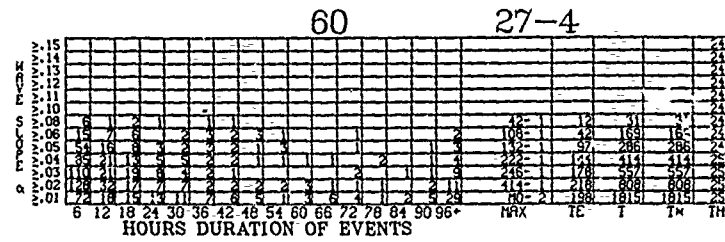
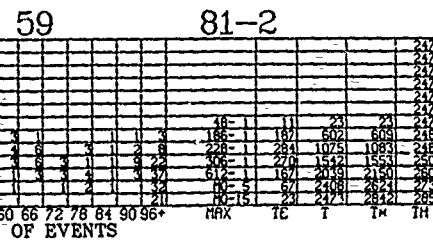
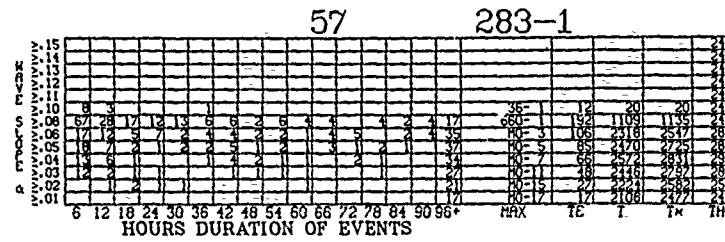
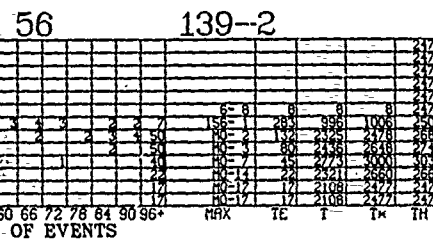
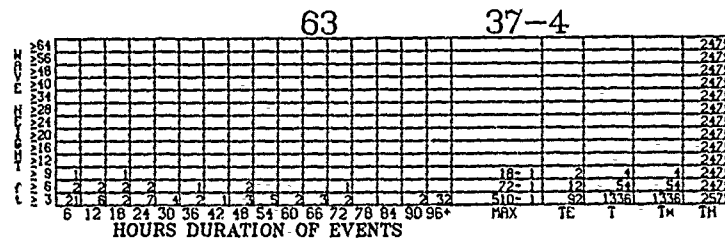
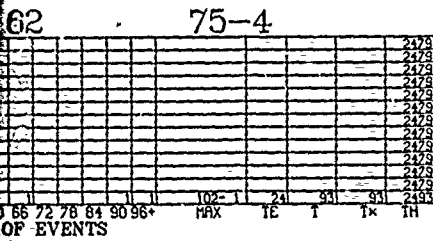
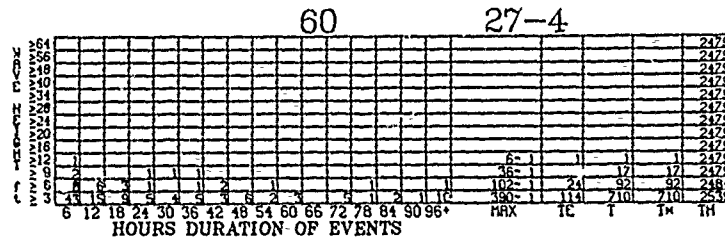
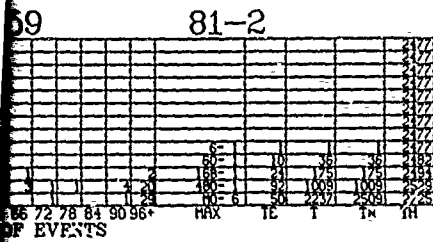
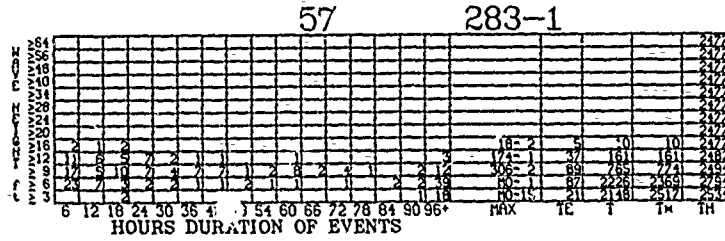
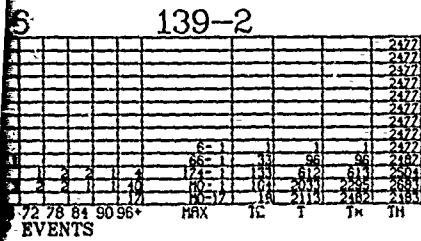
JULY

WAVE HEIGHT AN



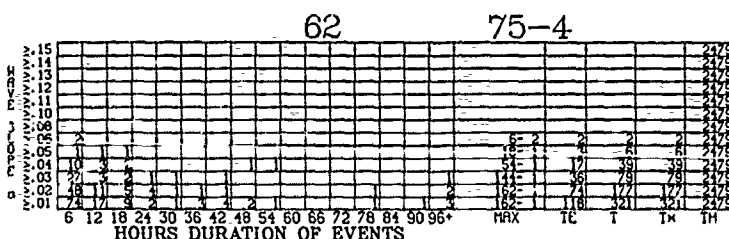
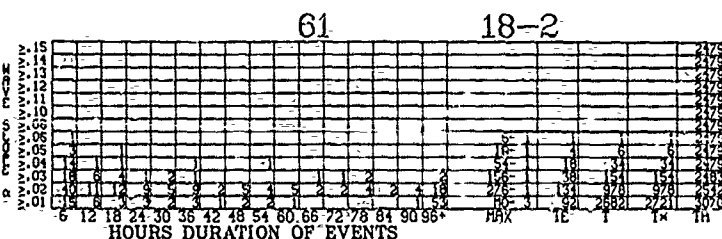
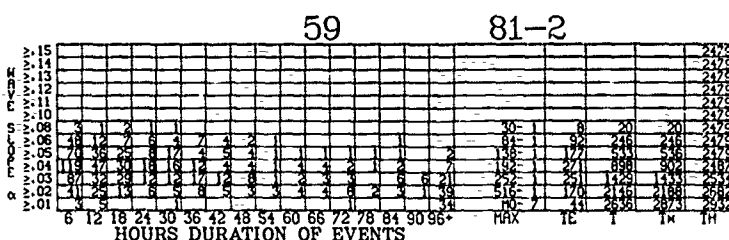
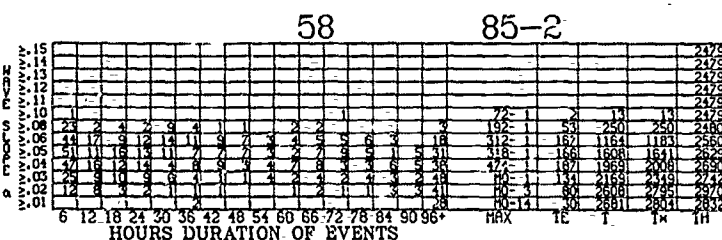
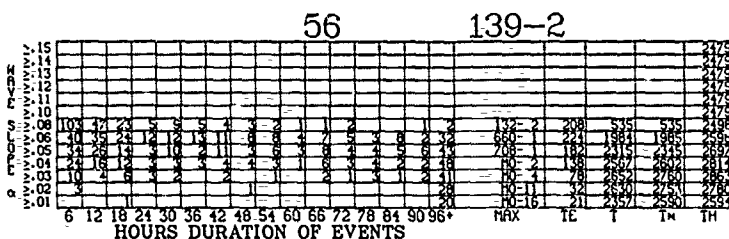
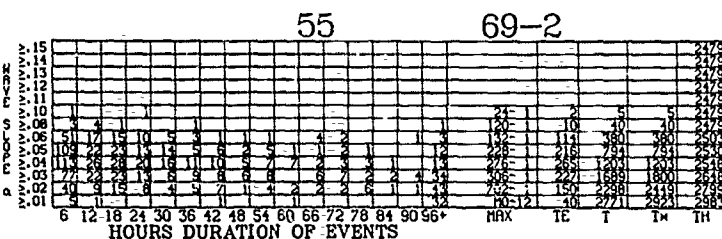
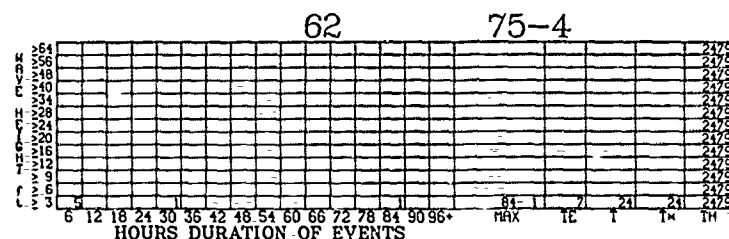
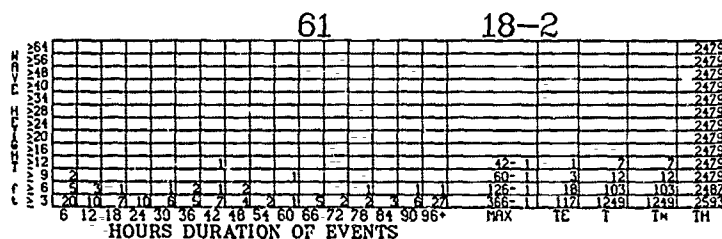
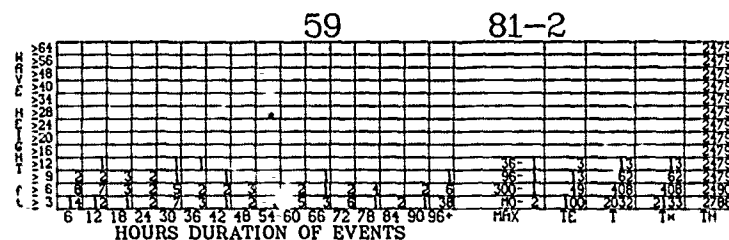
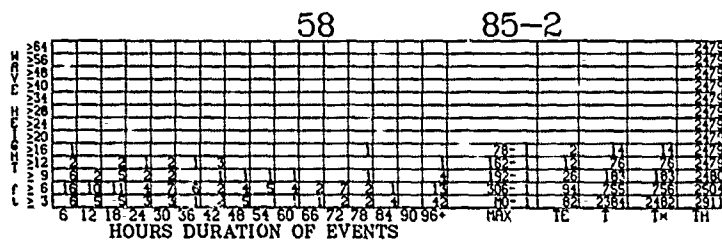
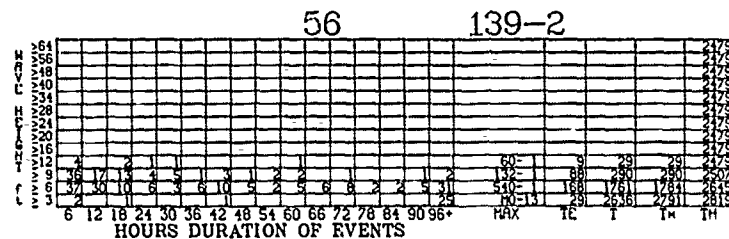
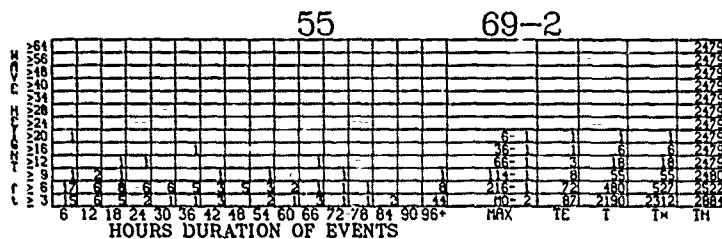


# AVE HEIGHT AND SLOPE ( $\alpha$ ) DURATIONS (Cont'd)





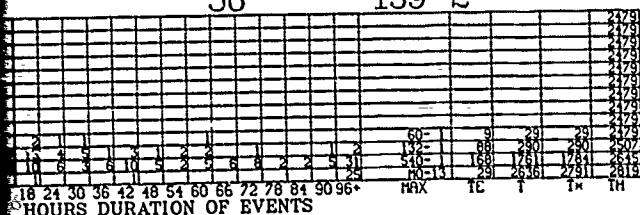
# WAVE HEIGHT AND SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



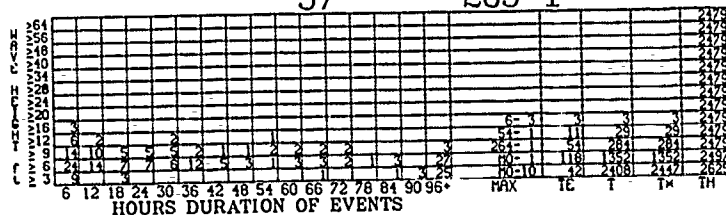
# RATIONS (Cont'd)

## AUGUST

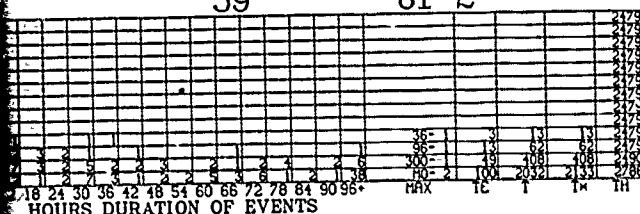
56 139-2



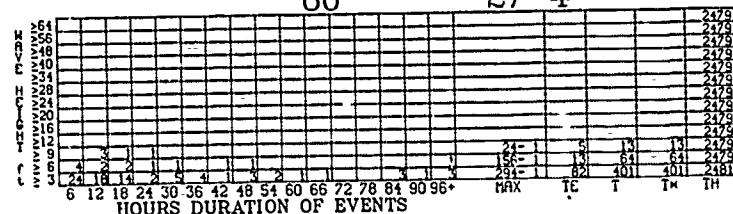
57 283-1



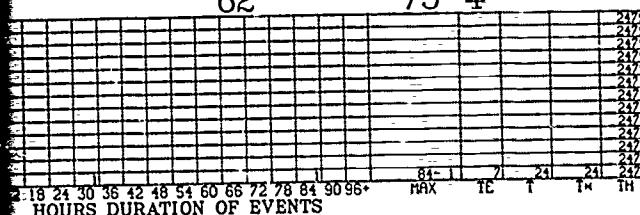
59 81-2



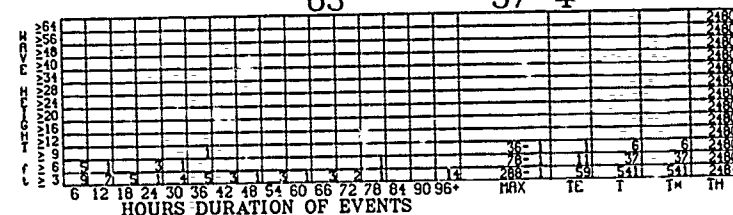
60 27-4



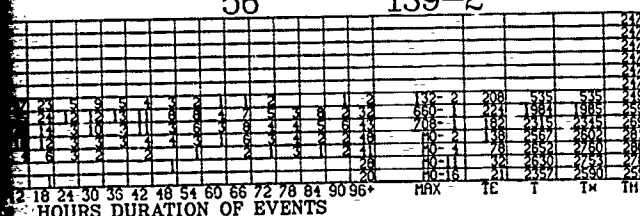
62 75-4



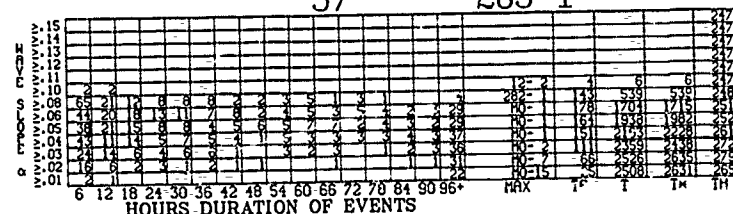
63 37-4



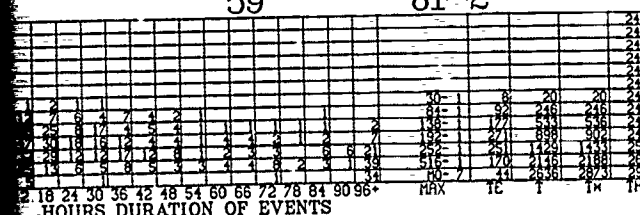
56 139-2



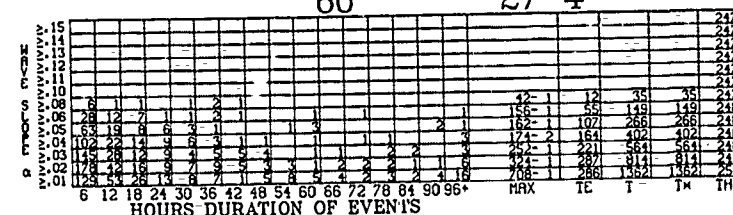
57 283-1



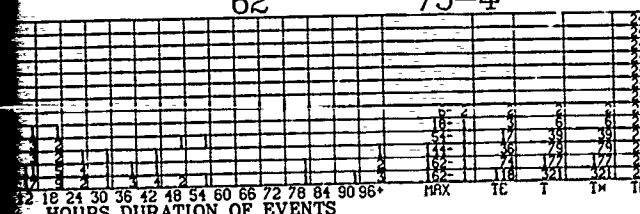
59 81-2



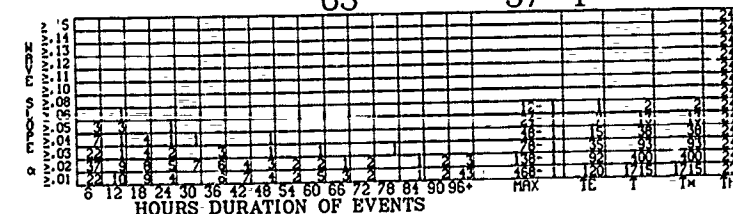
60 27-4



62 75-4

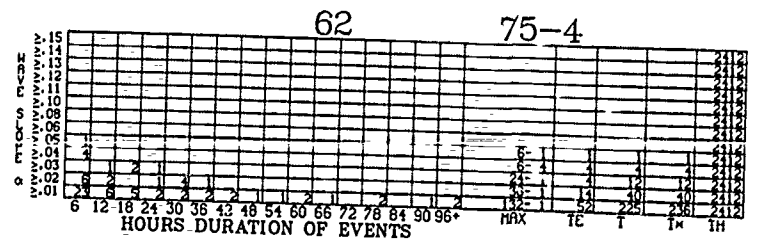
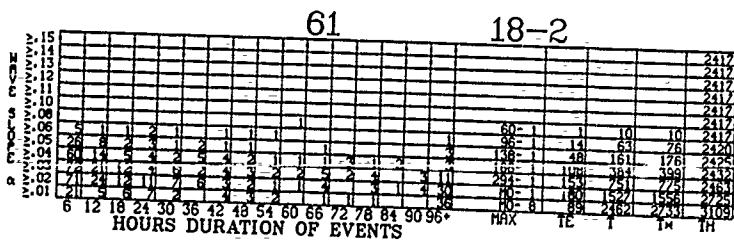
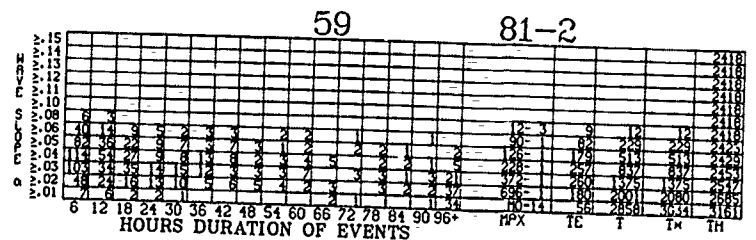
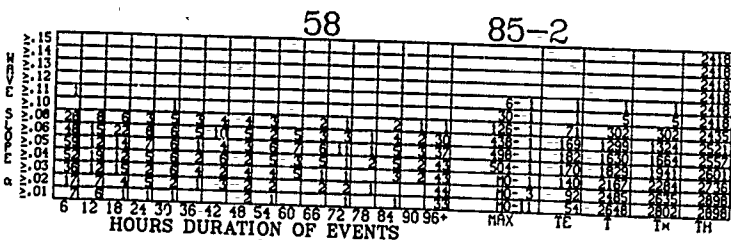
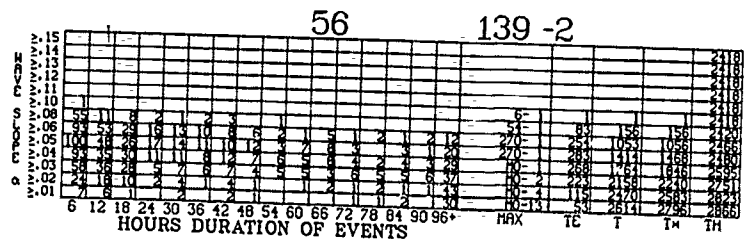
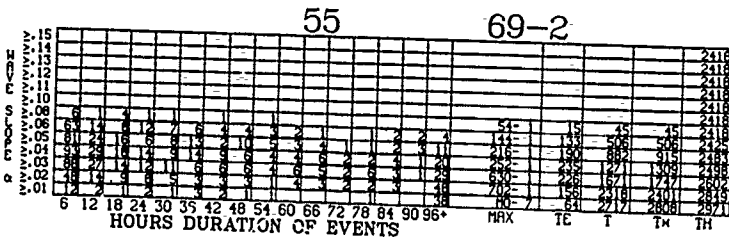
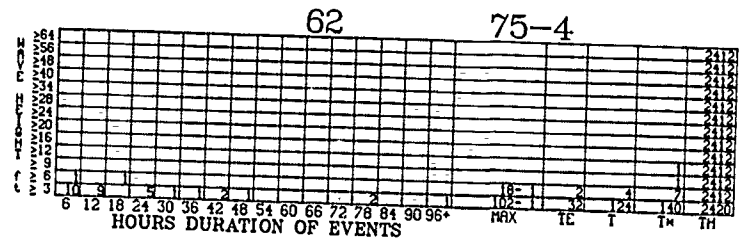
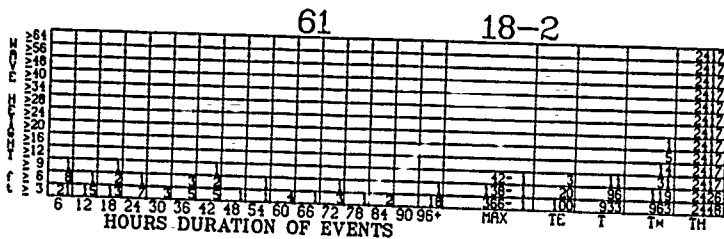
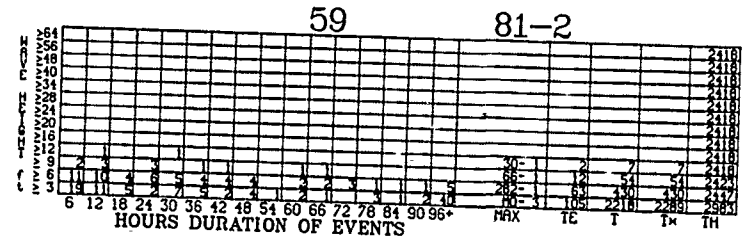
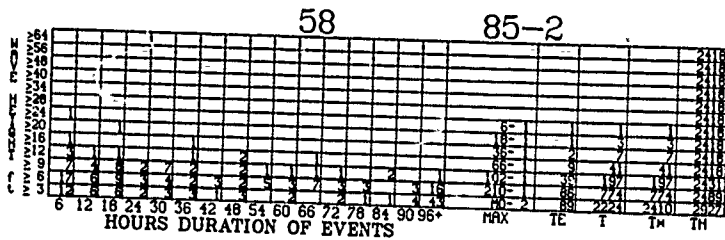
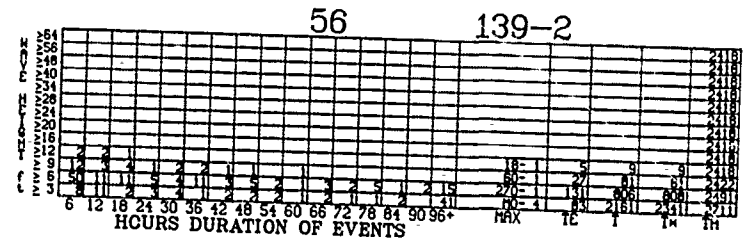
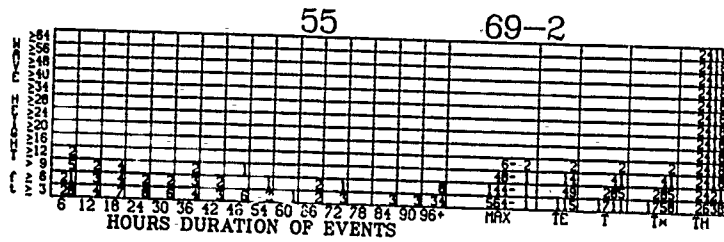


63 37-4

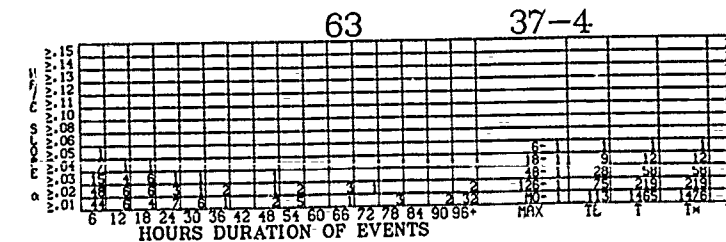
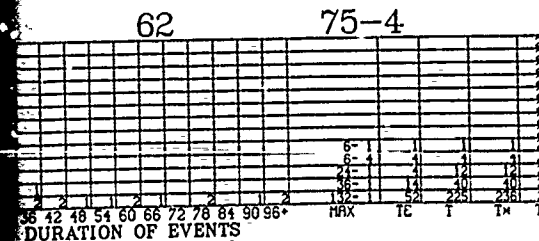
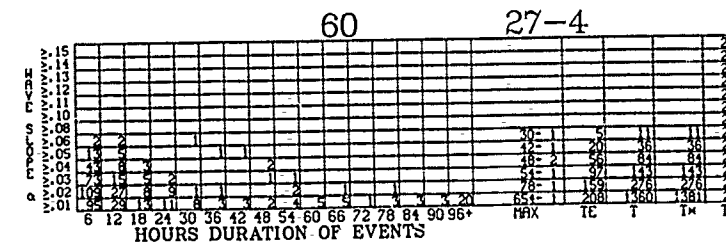
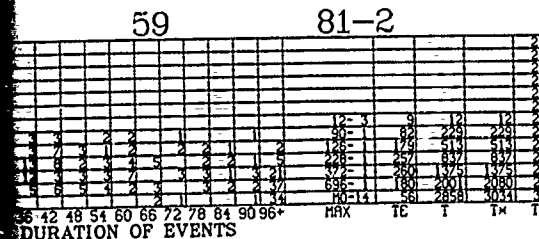
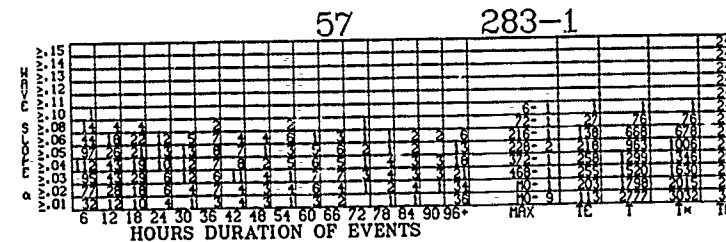
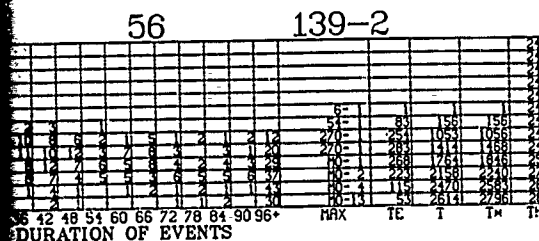
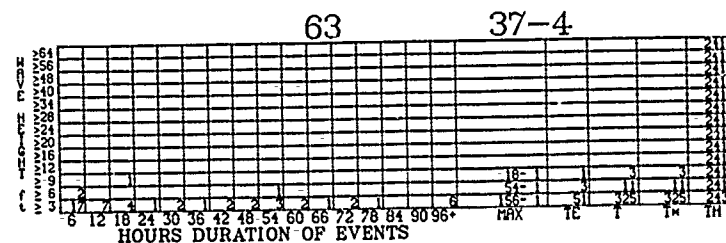
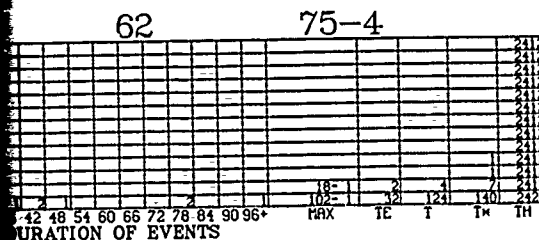
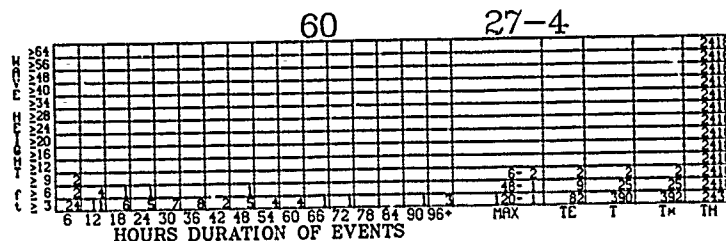
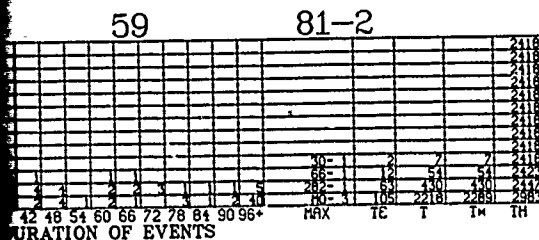
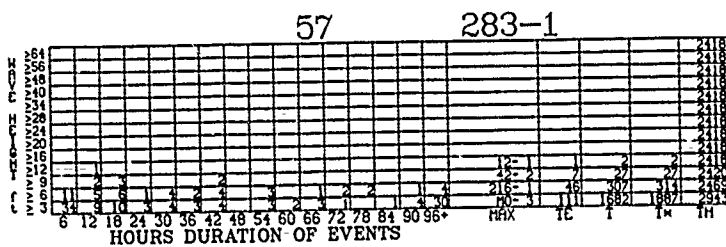
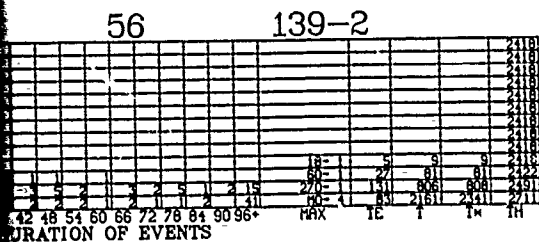


# OCTOBER

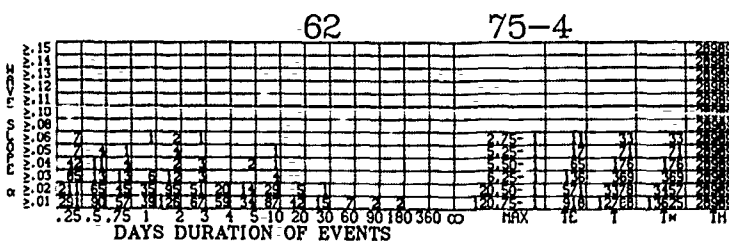
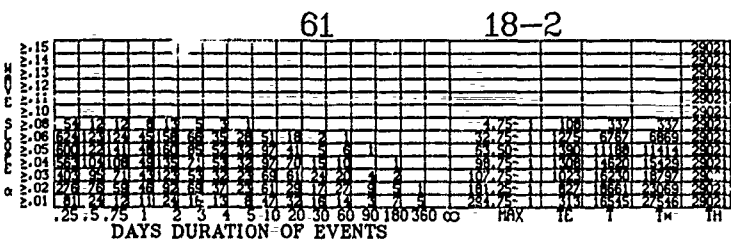
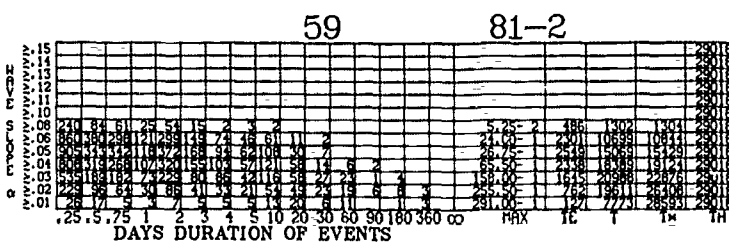
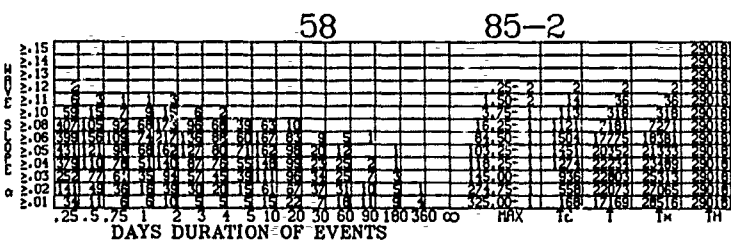
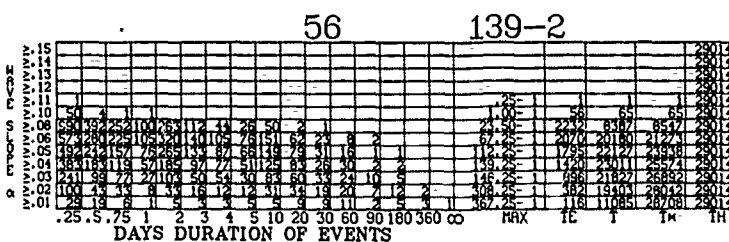
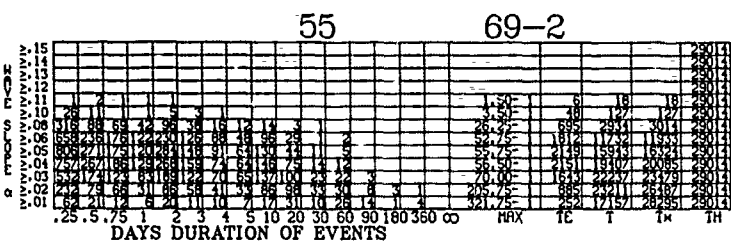
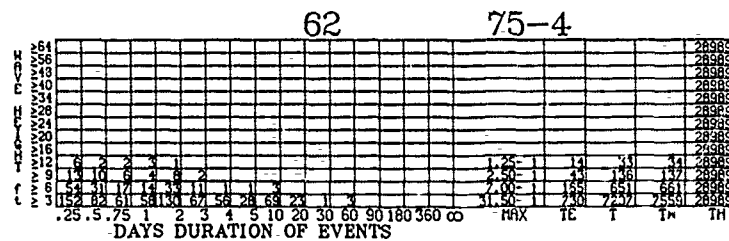
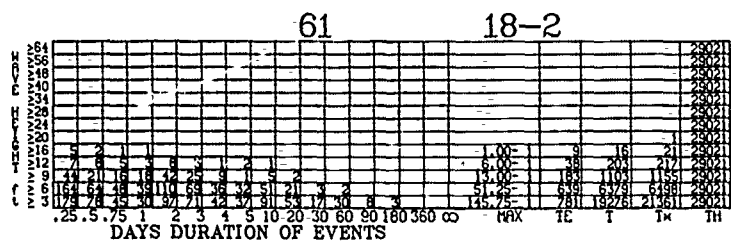
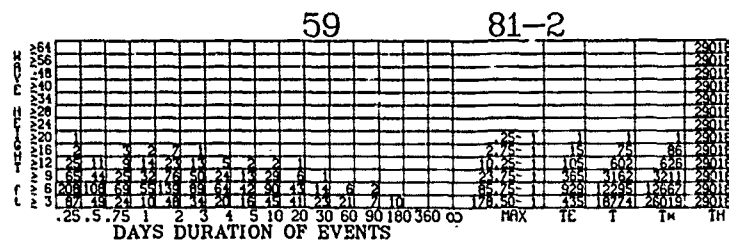
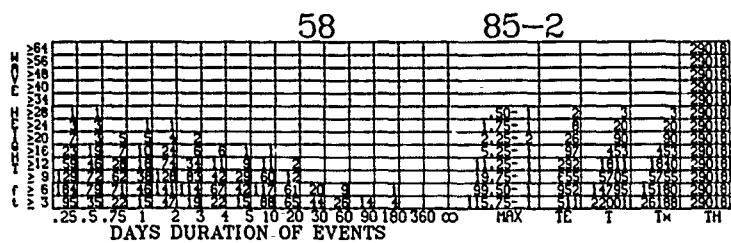
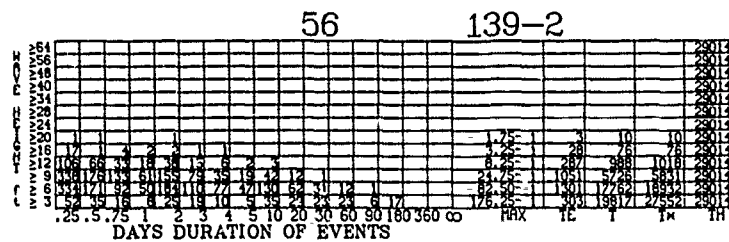
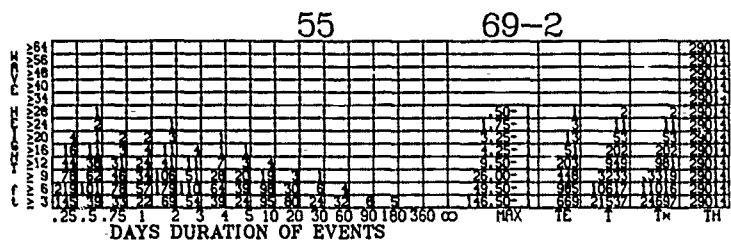
# WAVE HEIGHT AND S



# WAVE HEIGHT AND SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



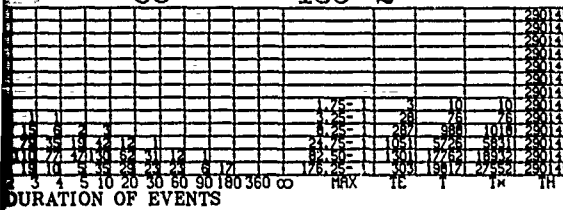
# WAVE HEIGHT AND SLOPE ( $\alpha$ ) DURATIONS (Cont'd)



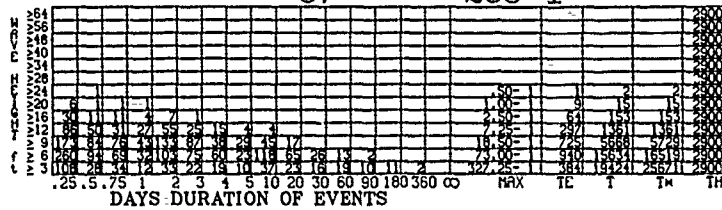
# IONS (Cont'd)

# ALL DAYS

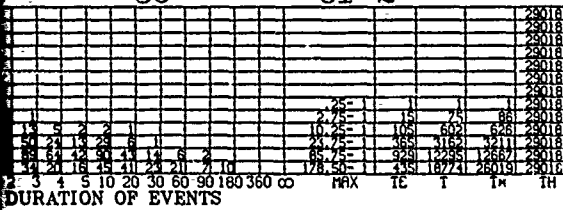
56 139-2



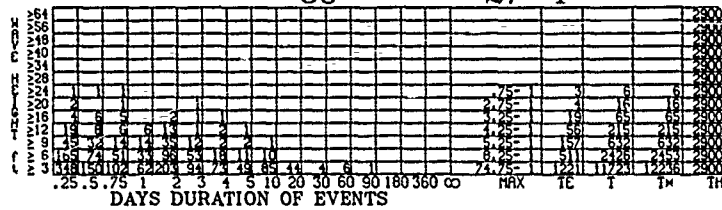
57 283-1



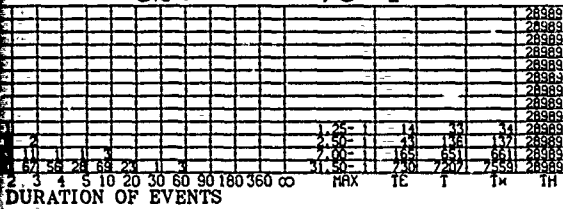
59 81-2



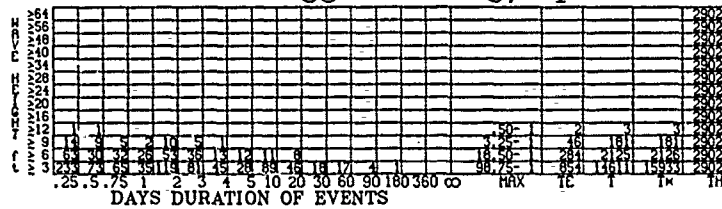
60 27-4



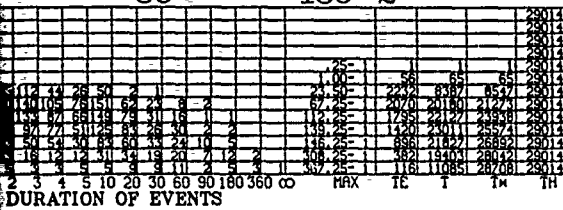
62 75-4



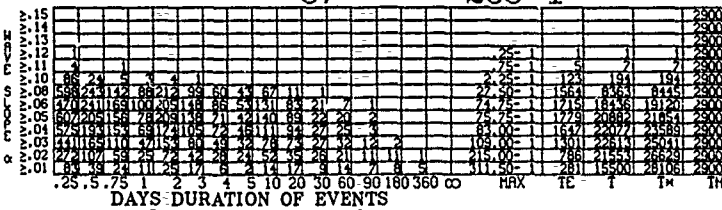
63 37-4



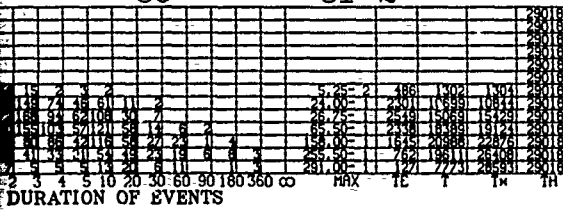
56 139-2



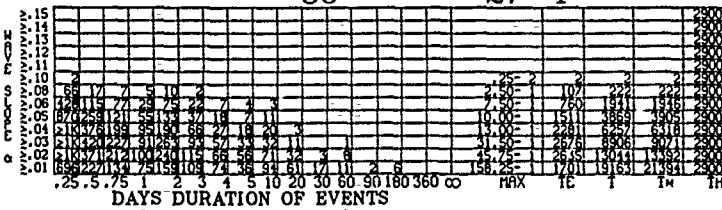
57 283-1



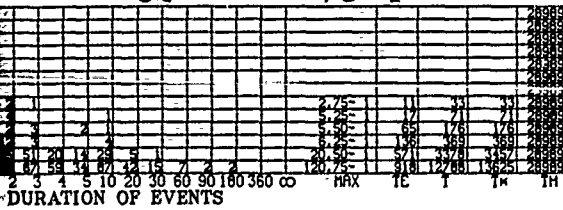
59 81-2



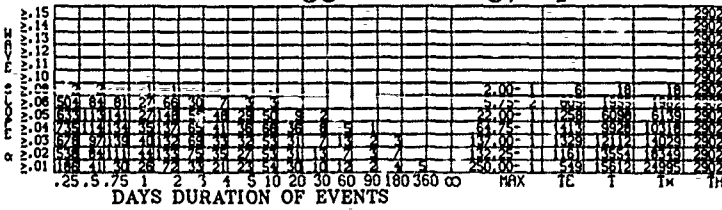
60 27-4



62 75-4



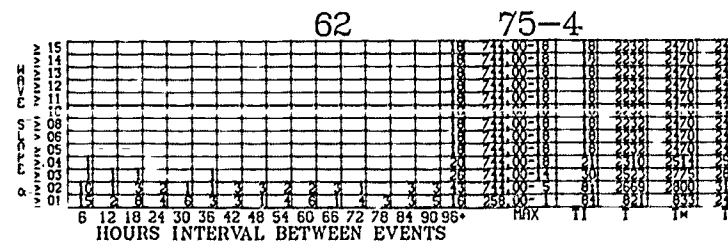
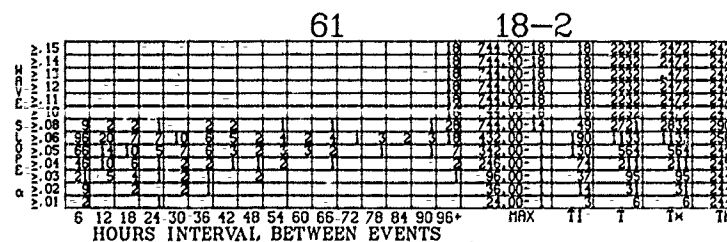
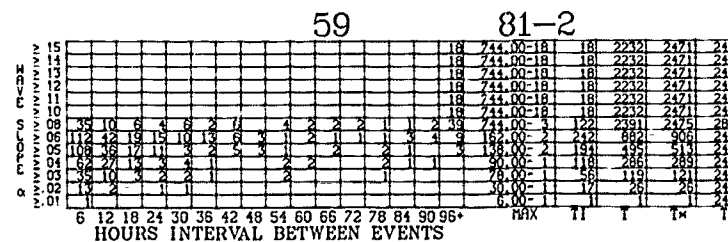
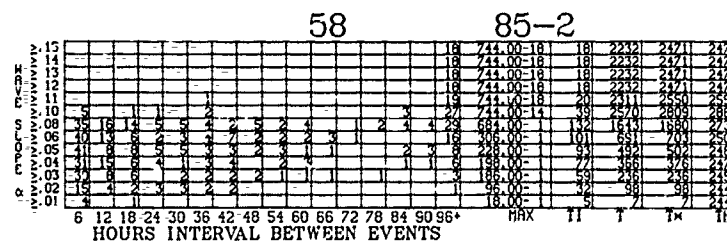
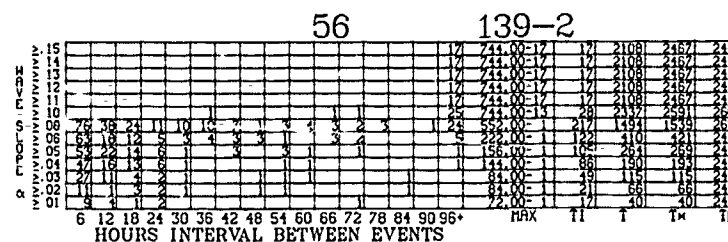
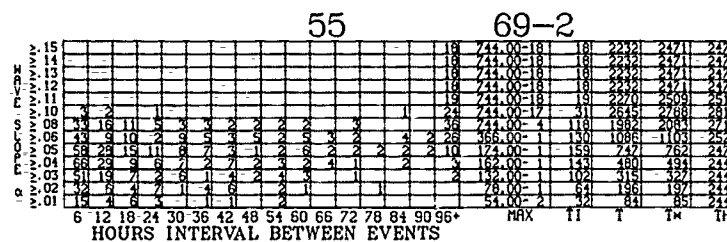
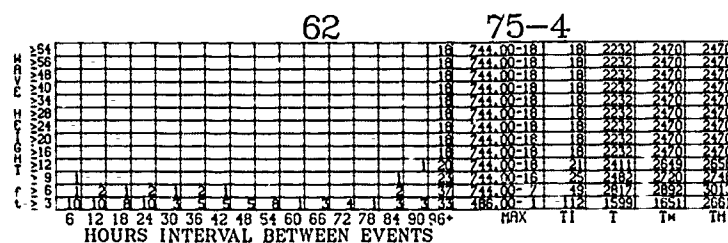
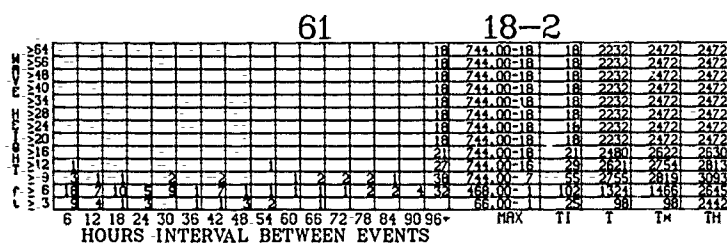
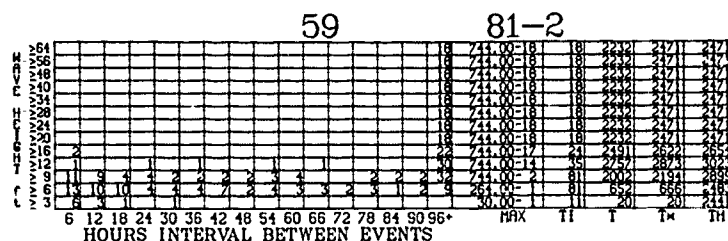
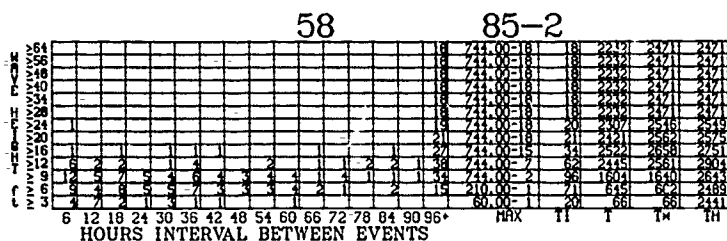
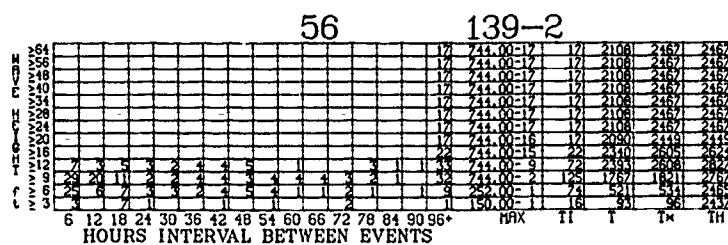
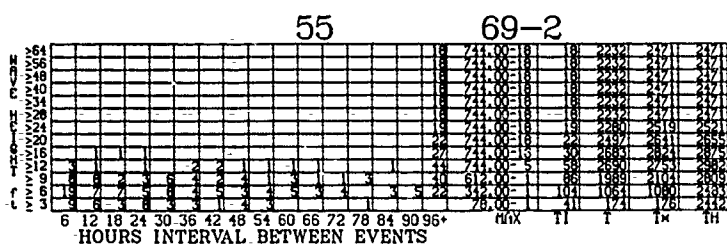
63 37-4





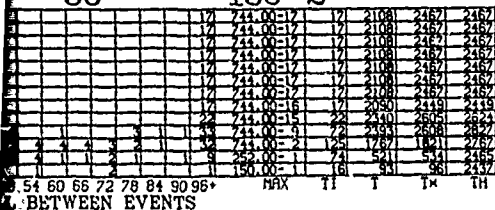
# JANUARY

# WAVE HEIGHT AND S

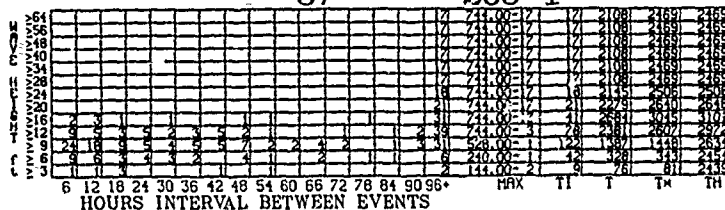


# WAVE HEIGHT AND SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

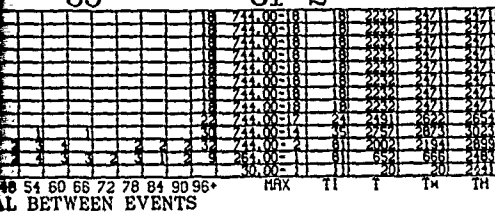
56 139-2



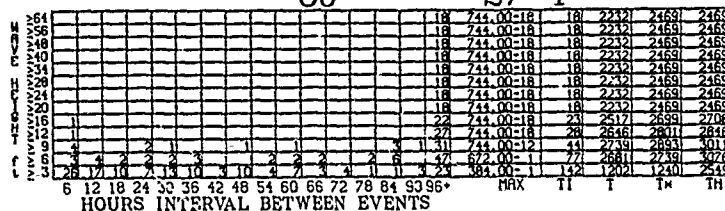
57 283-1



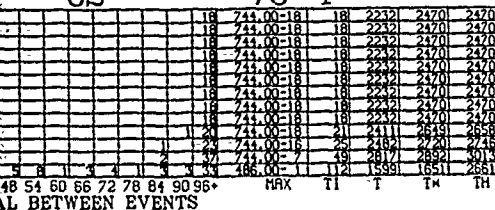
59 81-2



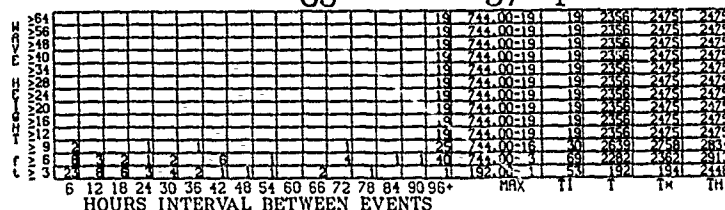
60 27-4



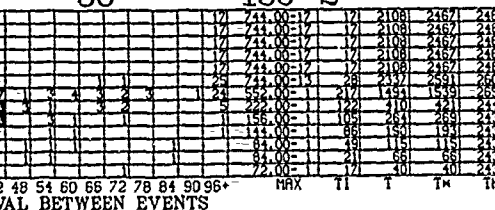
62 75-4



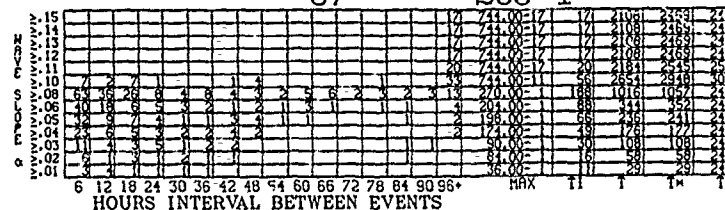
63 37-4



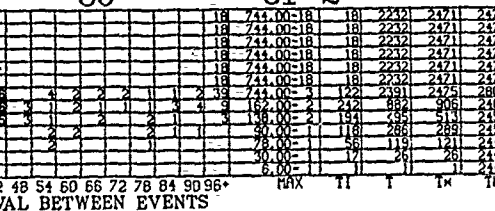
56 139-2



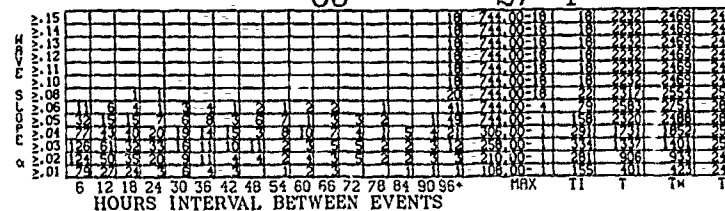
57 283-1



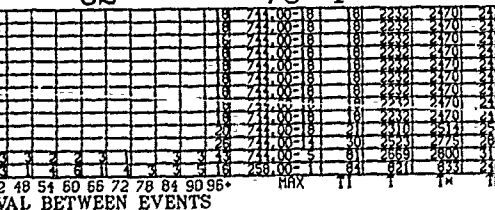
59 81-2



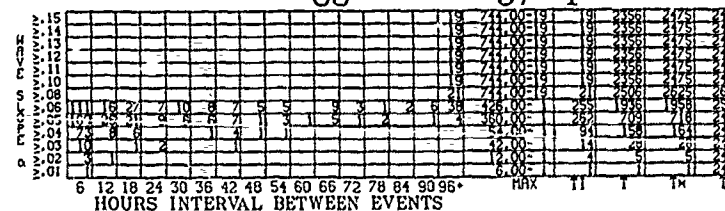
60 27-4



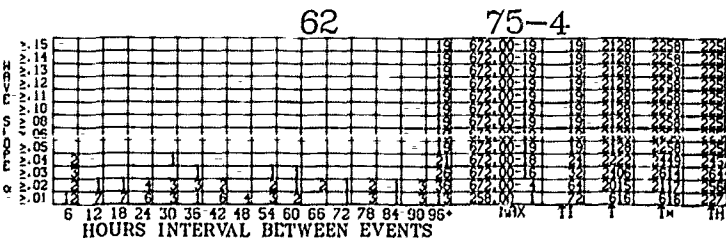
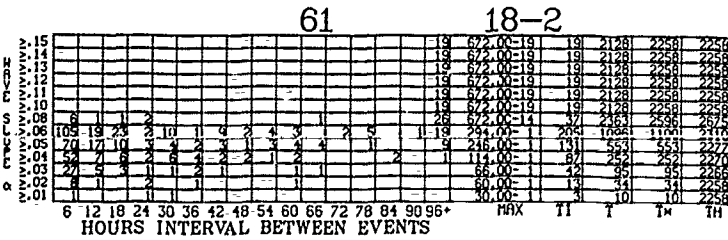
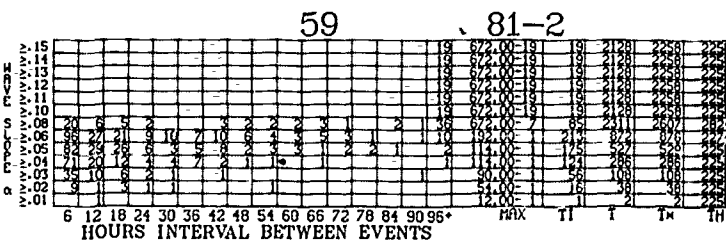
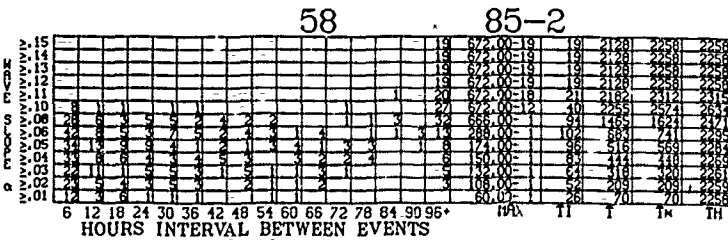
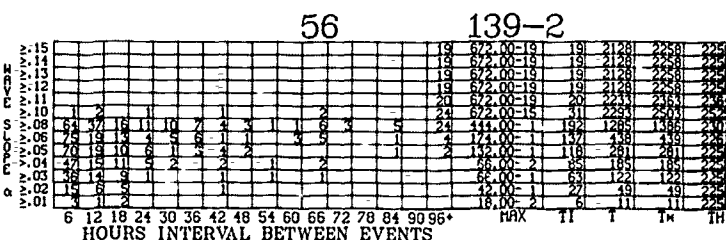
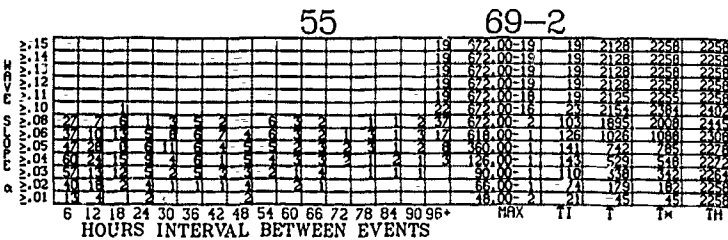
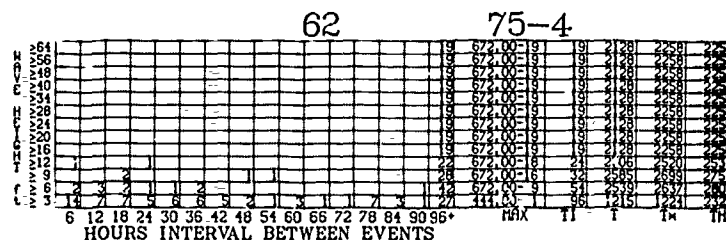
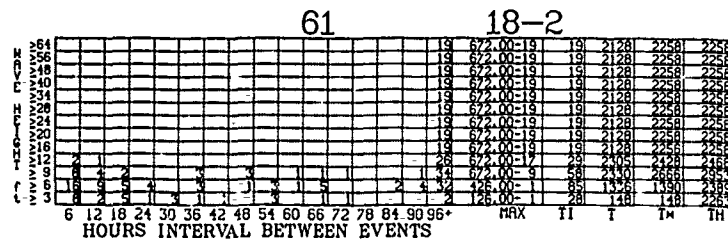
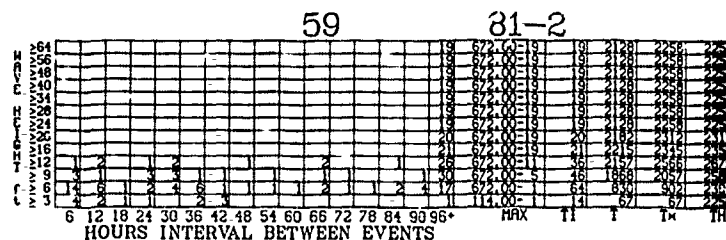
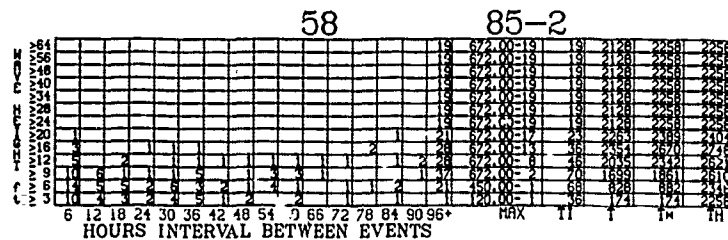
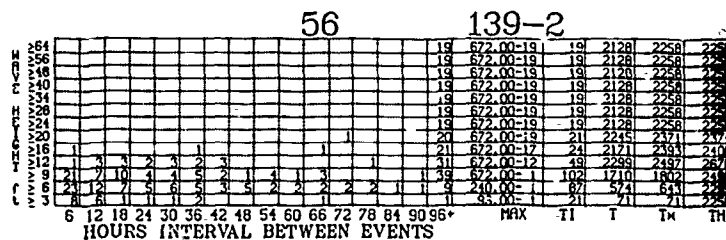
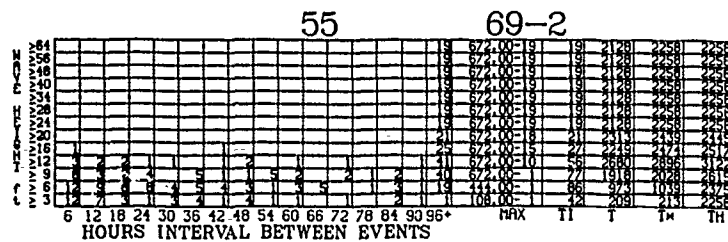
62 75-4



63 37-4

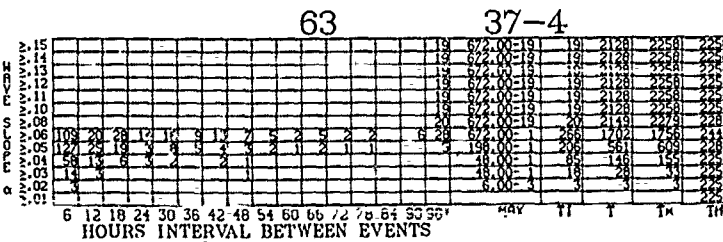
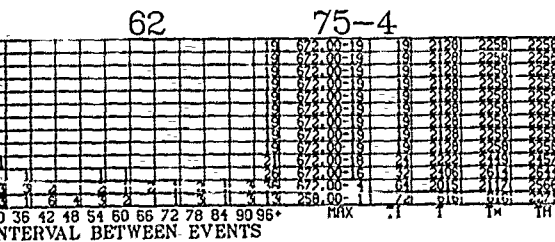
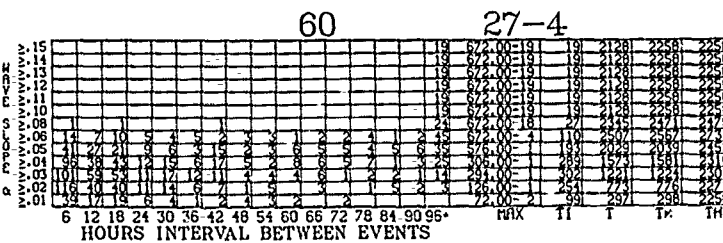
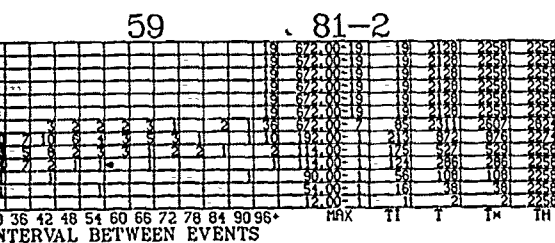
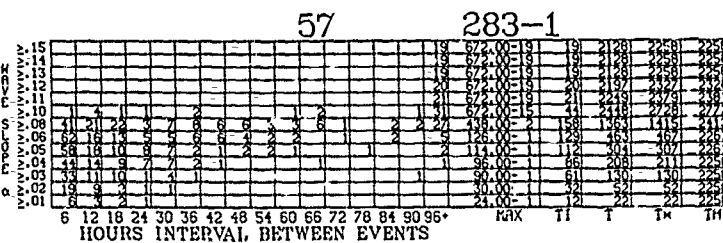
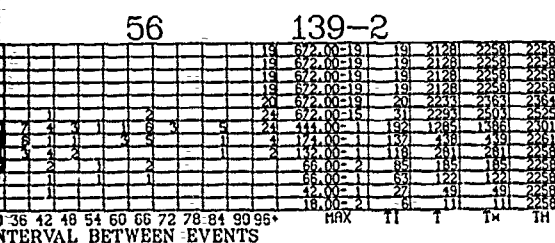
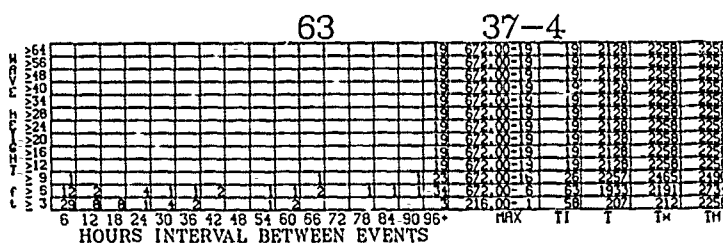
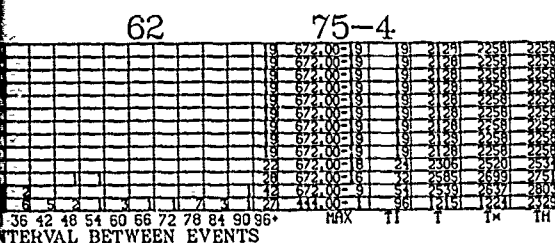
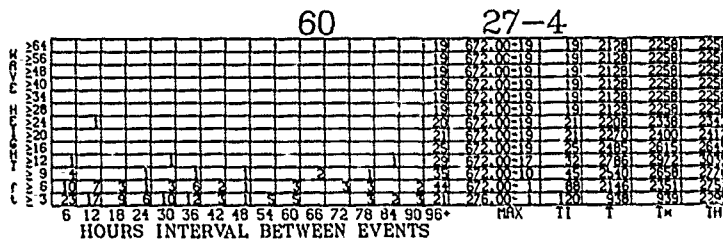
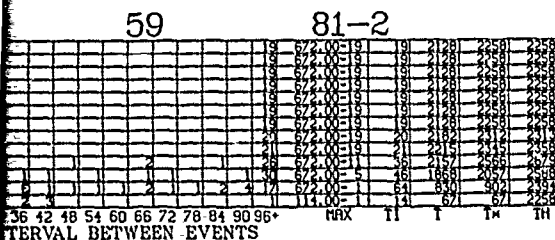
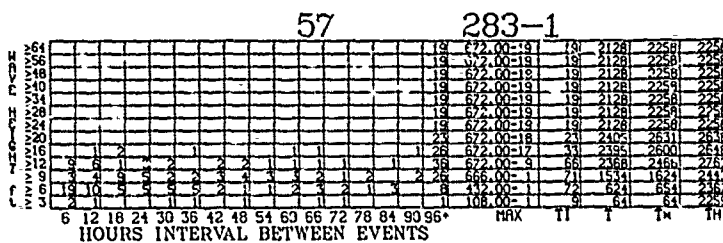
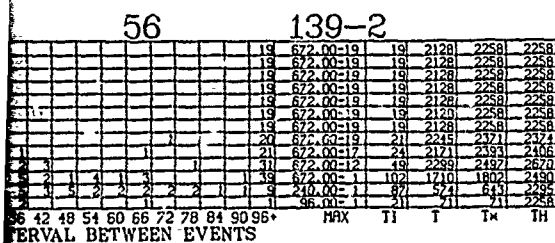


# WAVE HEIGHT AND SLOPE ( $\alpha$ ) INTERVALS (Cont'd)



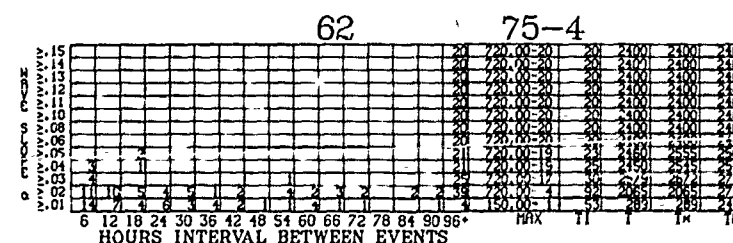
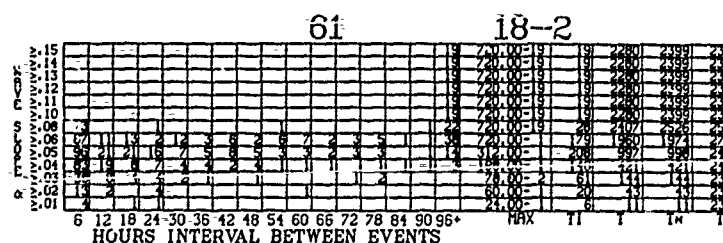
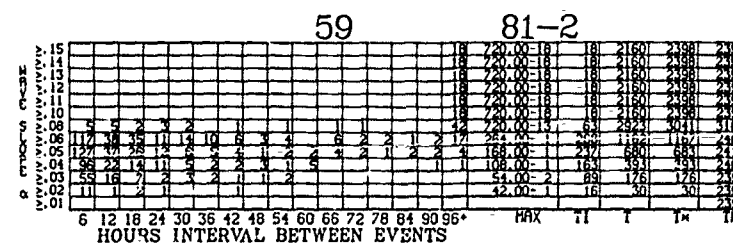
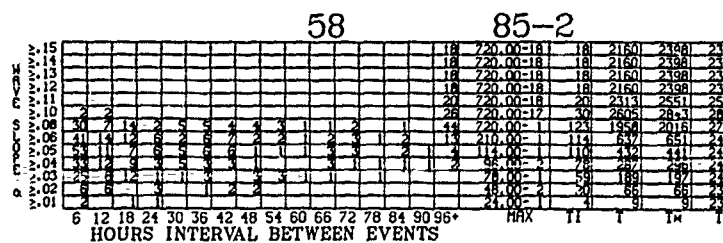
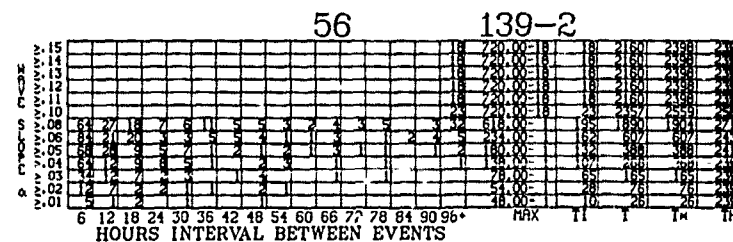
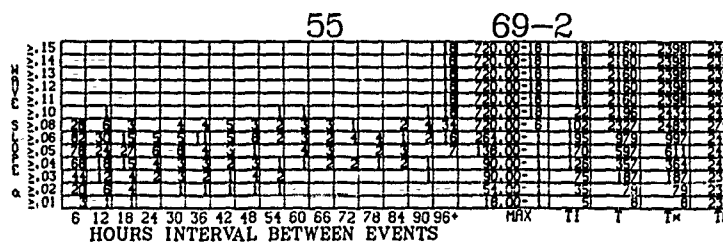
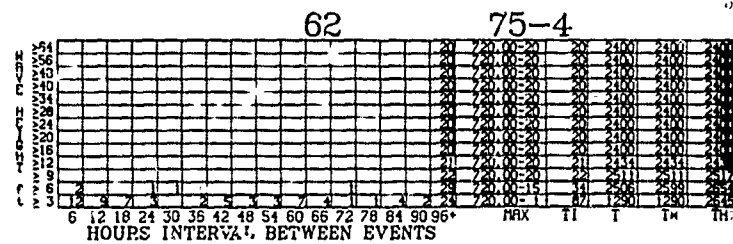
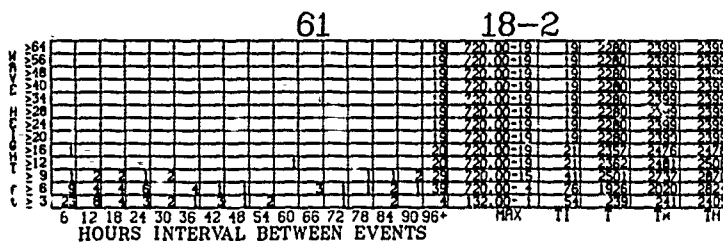
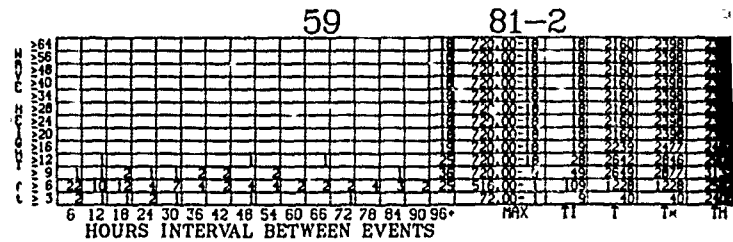
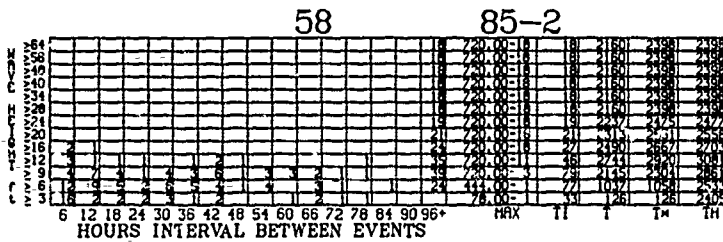
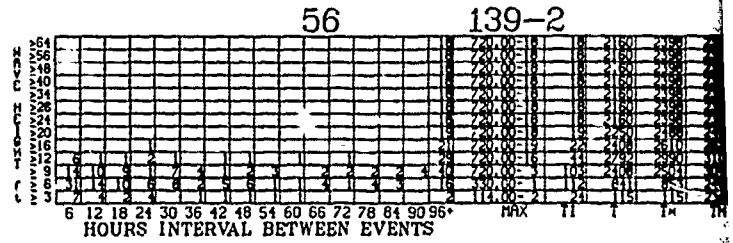
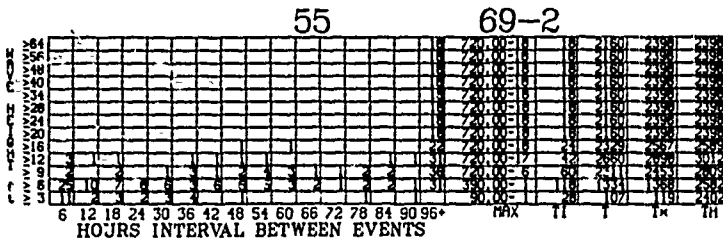
ALS (Cont'd)

FEBRUARY



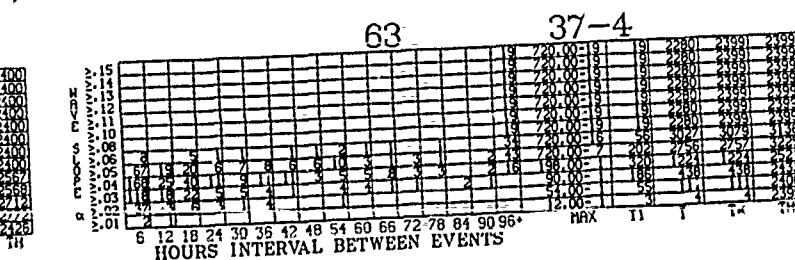
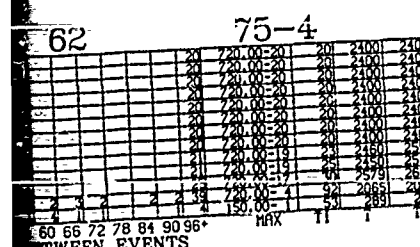
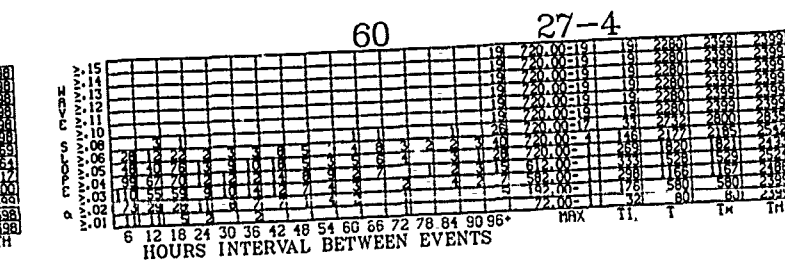
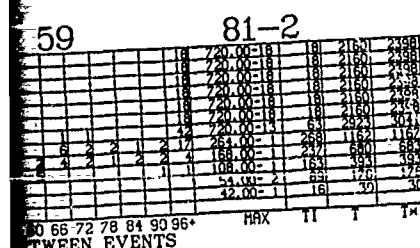
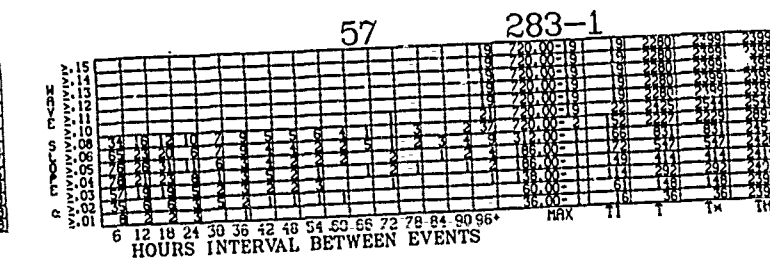
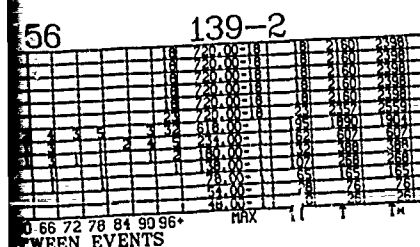
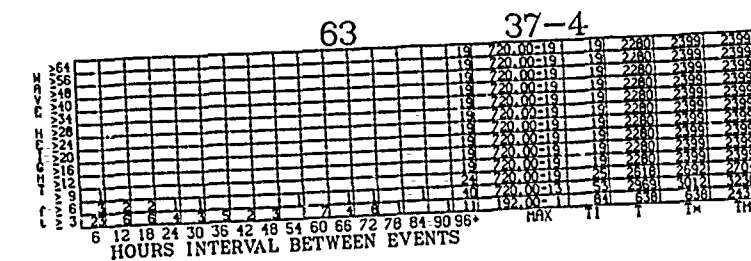
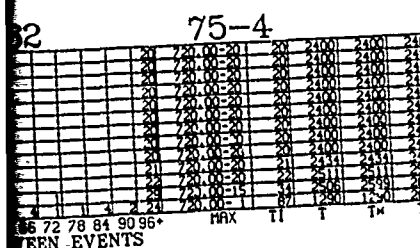
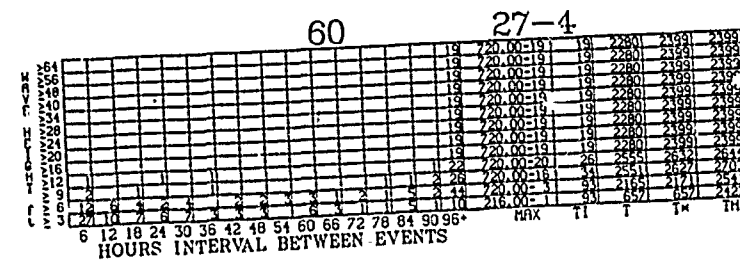
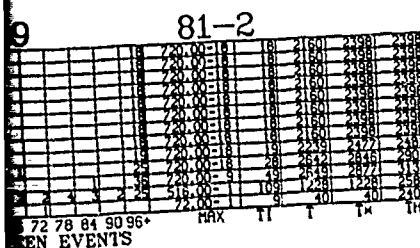
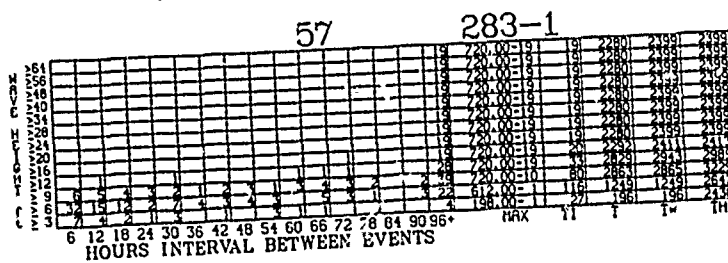
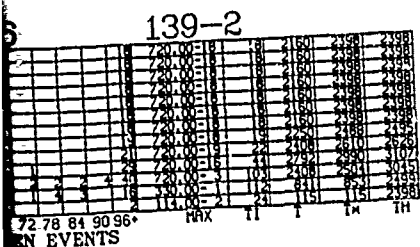
APRIL

WAVE HEIGHT AN



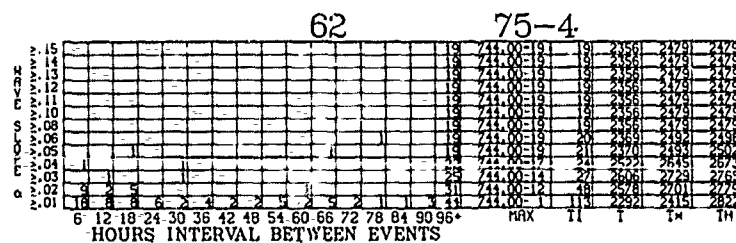
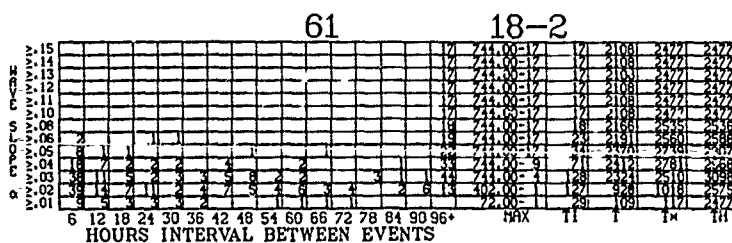
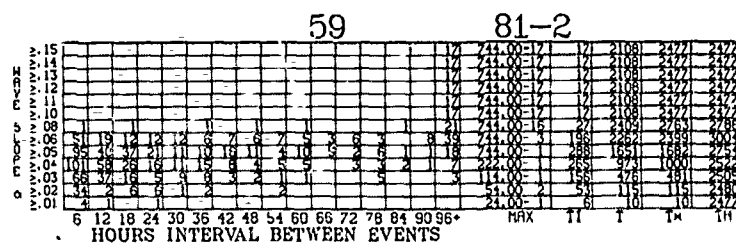
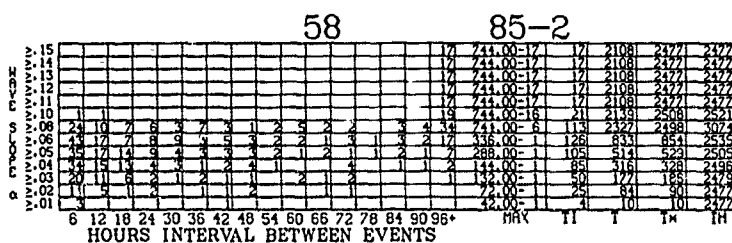
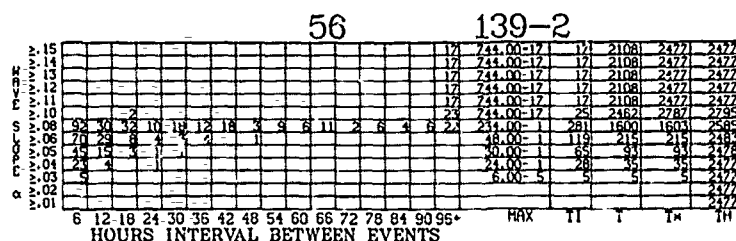
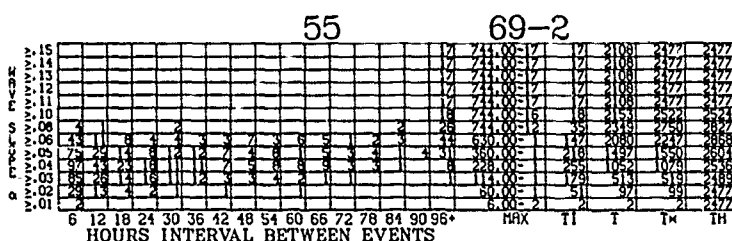
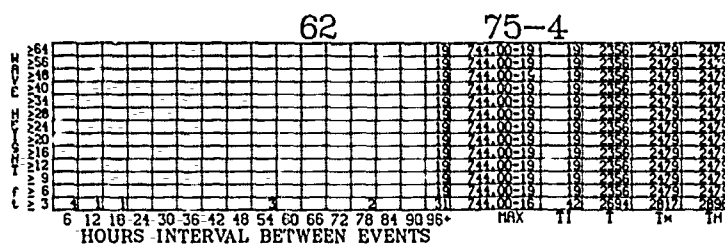
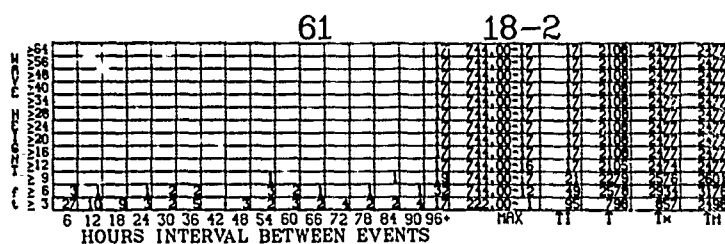
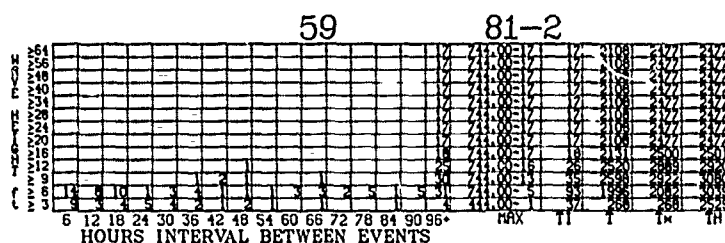
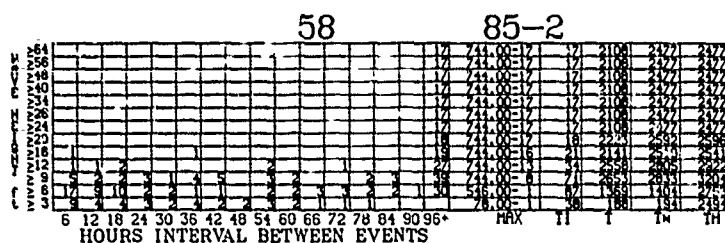
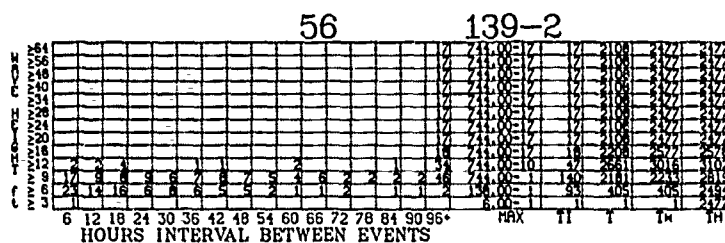
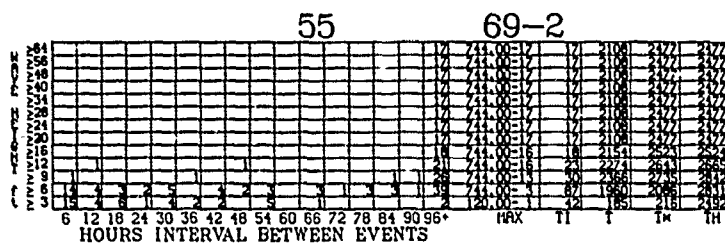


# AVE HEIGHT AND SLOPE ( $\alpha$ ) INTERVALS (Cont'd)





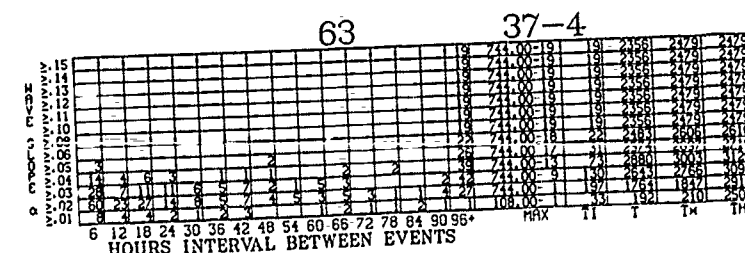
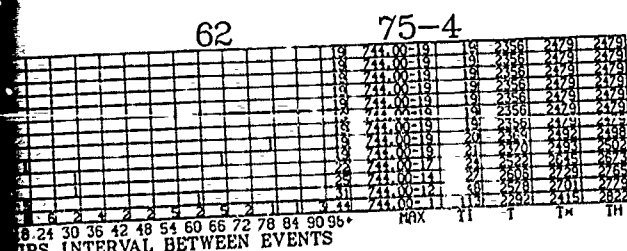
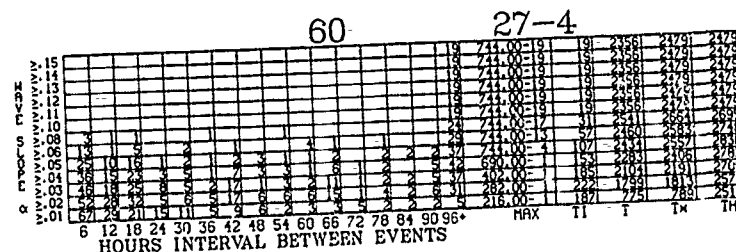
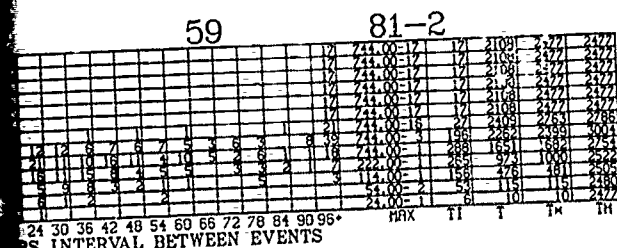
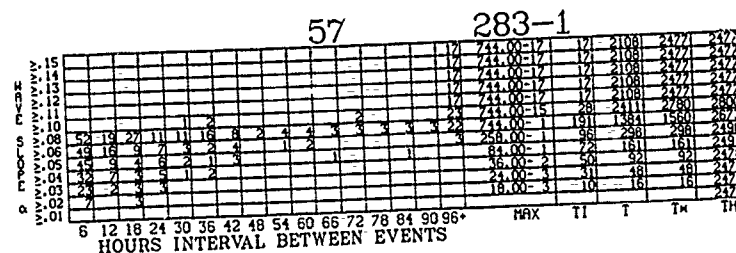
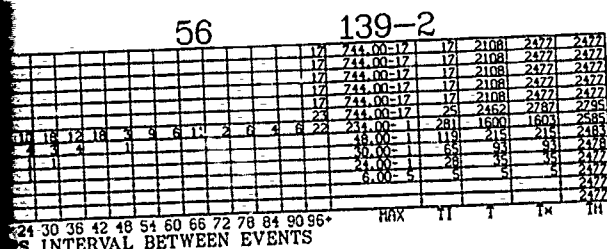
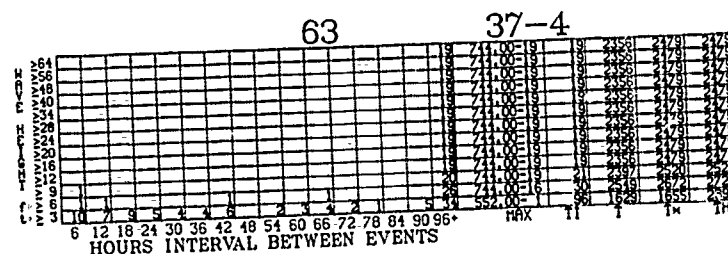
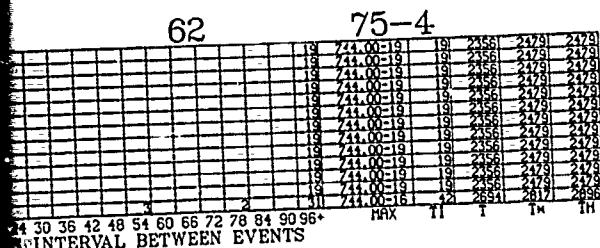
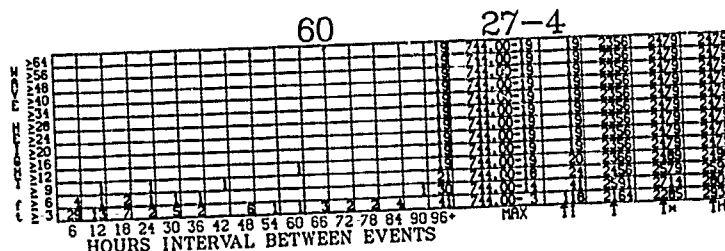
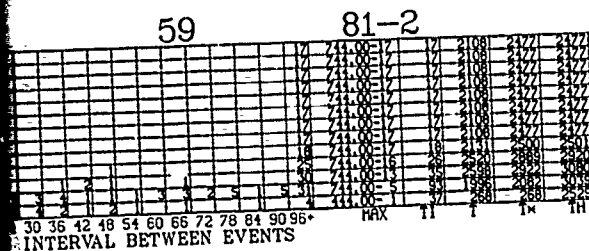
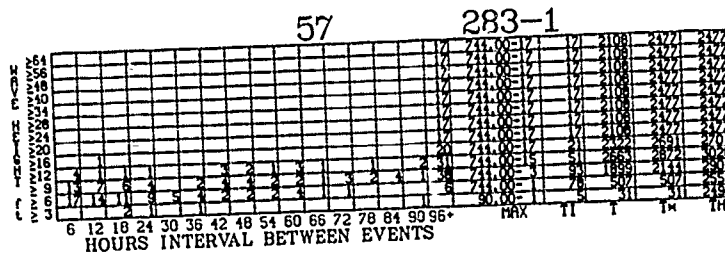
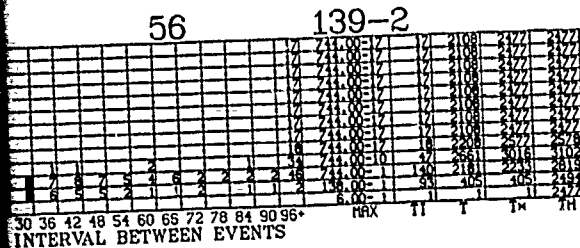
# WAVE HEIGHT AND SLOPE ( $\alpha$ ) INTERVALS (Cont'd)



①

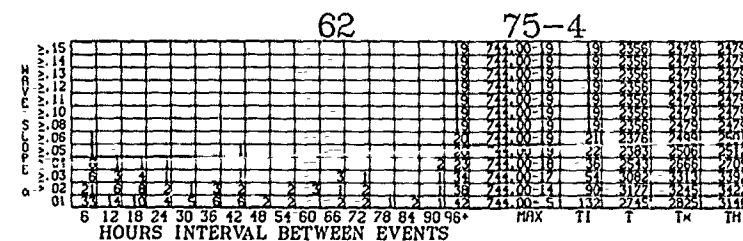
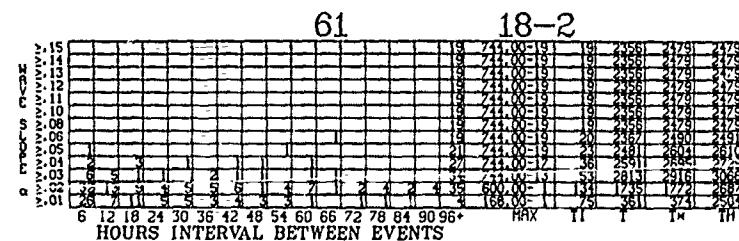
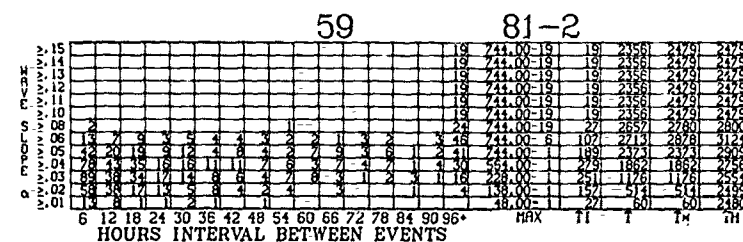
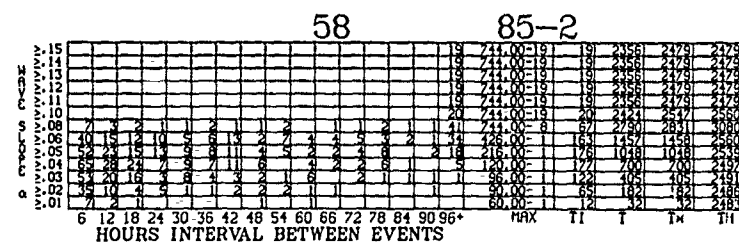
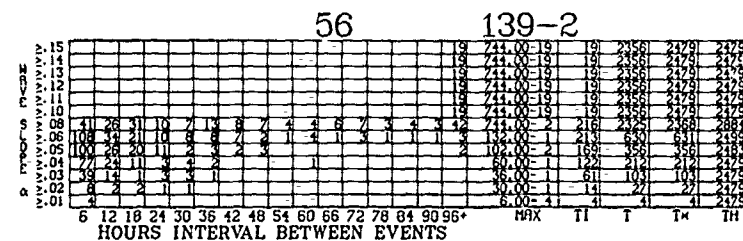
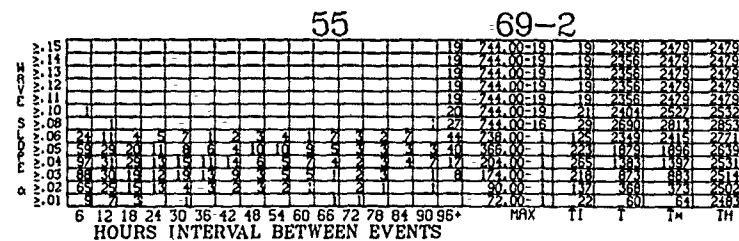
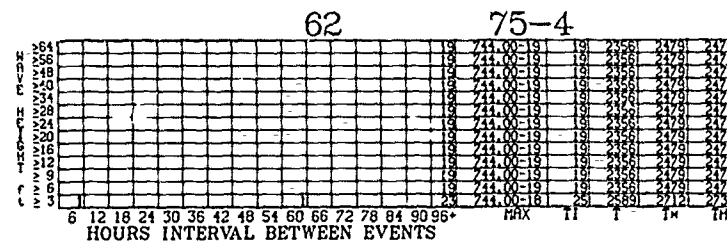
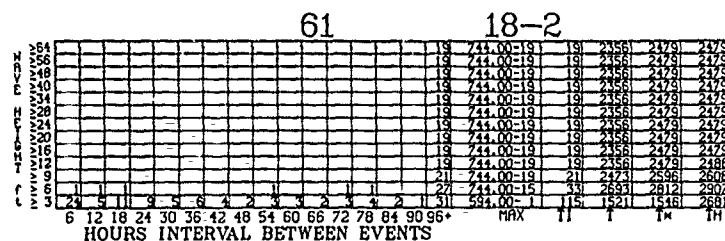
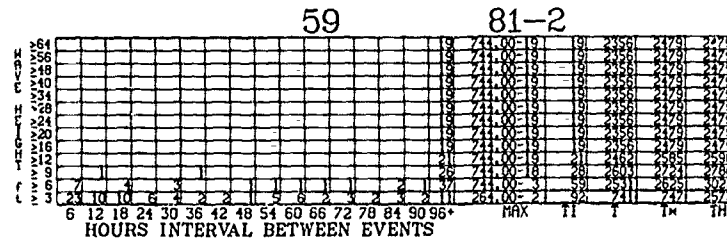
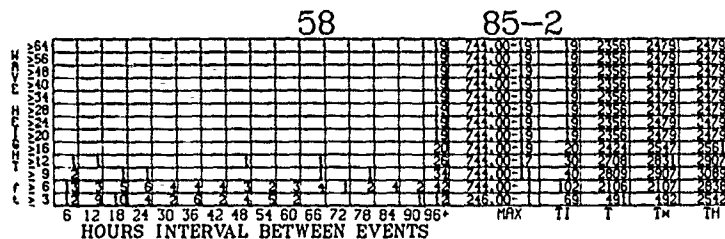
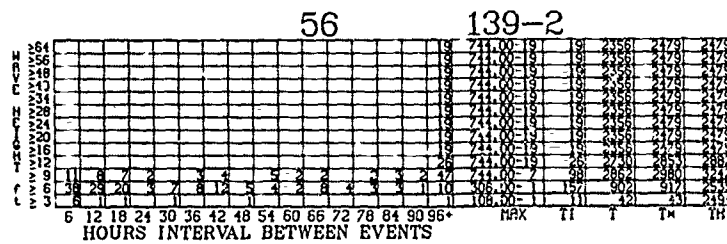
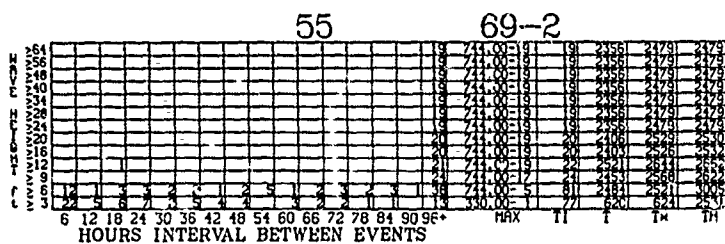
# ALS (Cont'd)

JULY



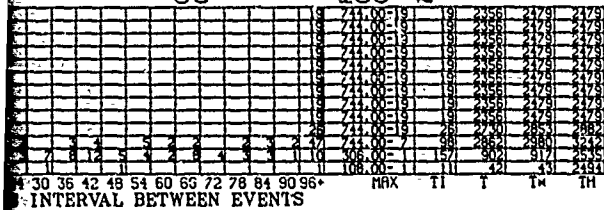
# AUGUST

# WAVE HEIGHT AND

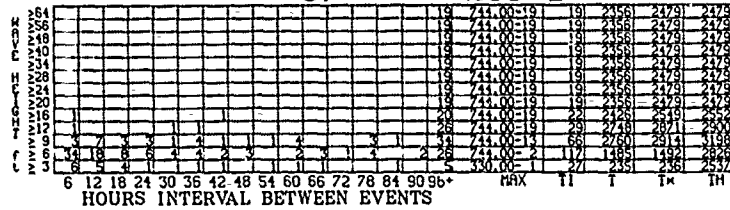


# WAVE HEIGHT AND SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

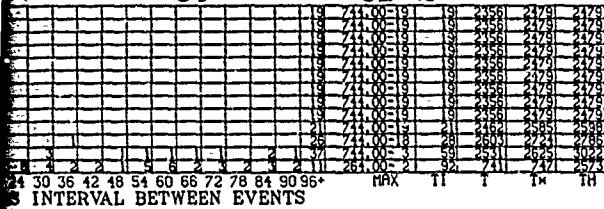
56 139-2



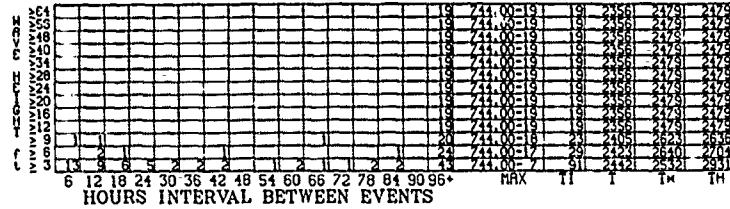
57 283-1



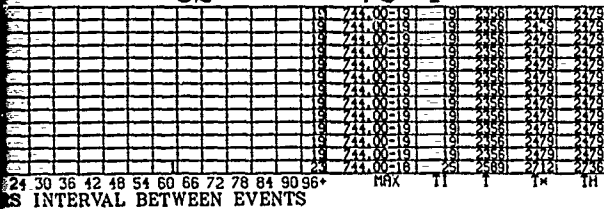
59 81-2



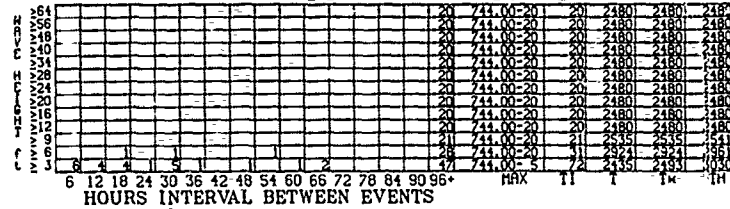
60 27-4



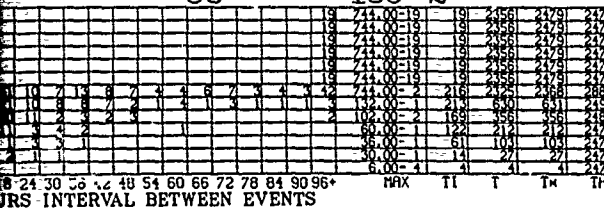
62 75-4



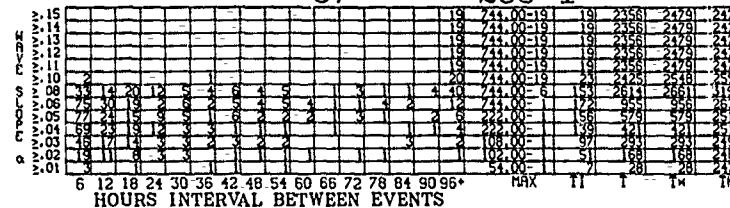
63 37-4



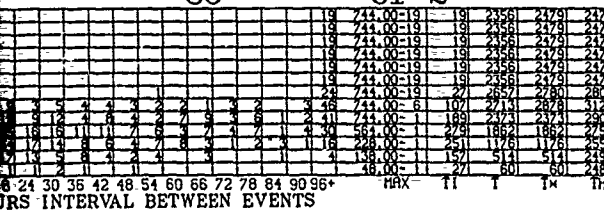
56 139-2



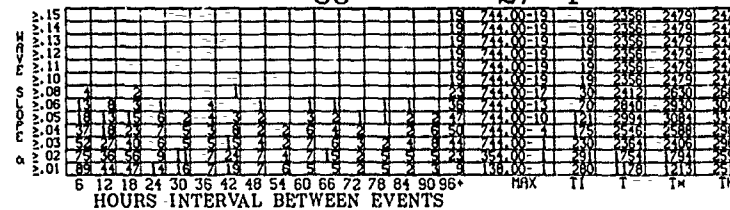
57 283-1



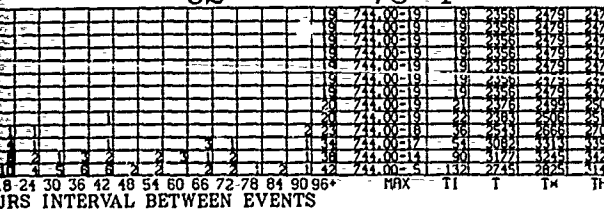
59 81-2



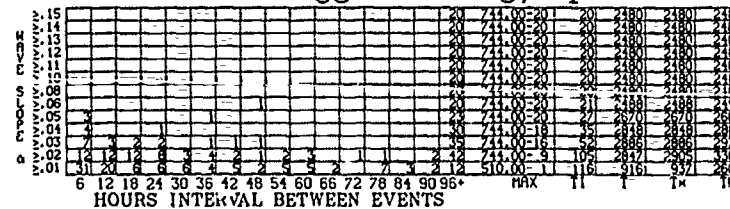
60 27-4



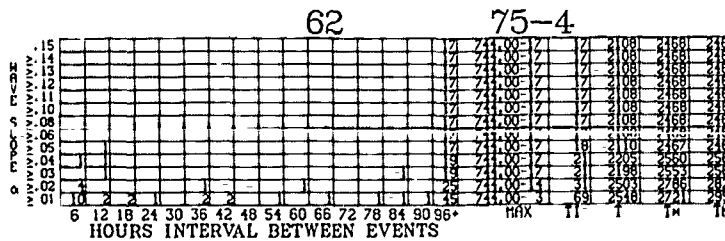
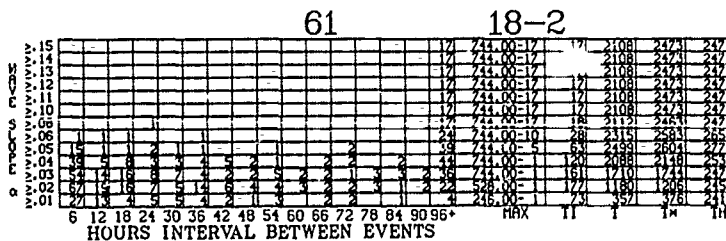
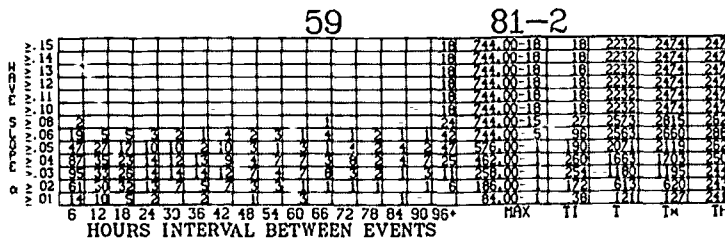
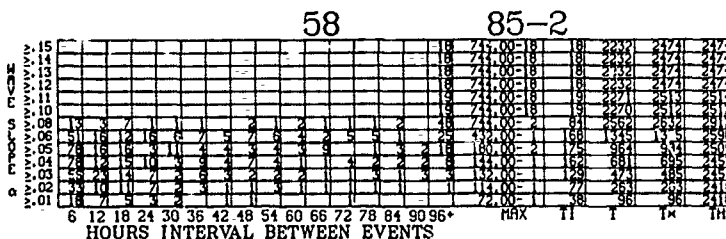
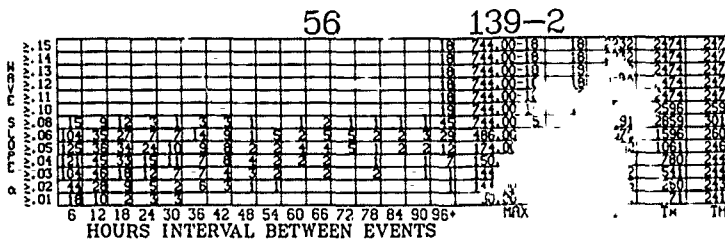
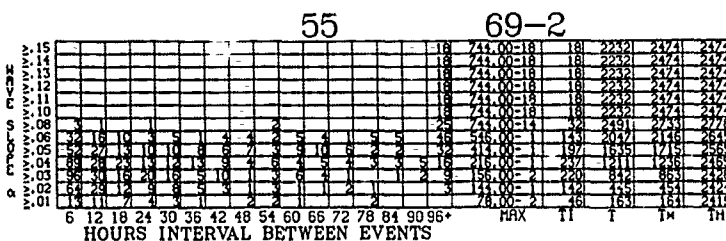
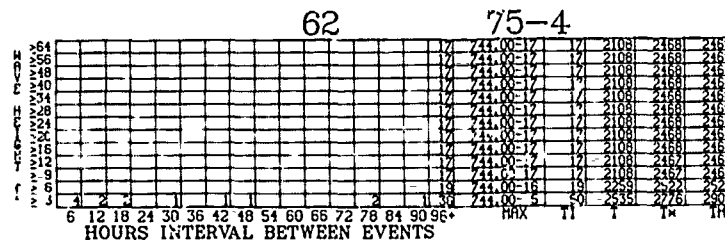
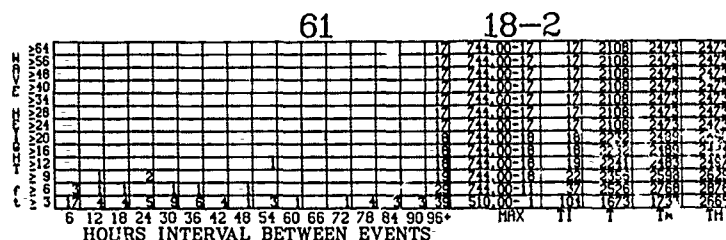
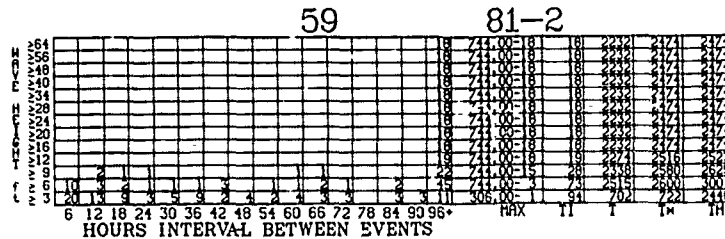
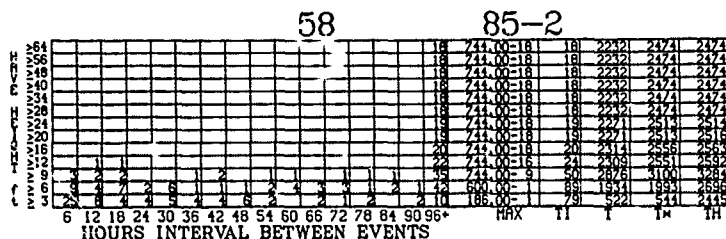
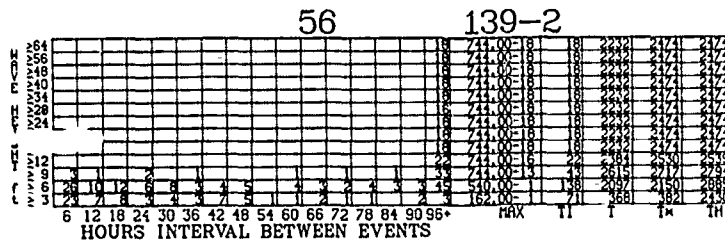
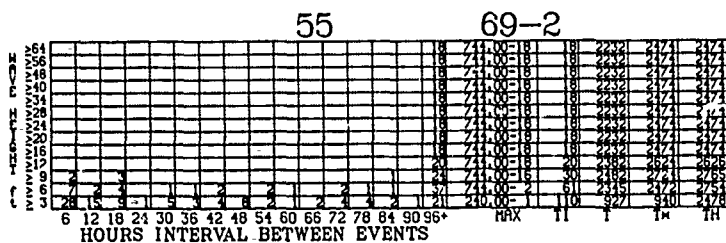
62 75-4



63 37-4



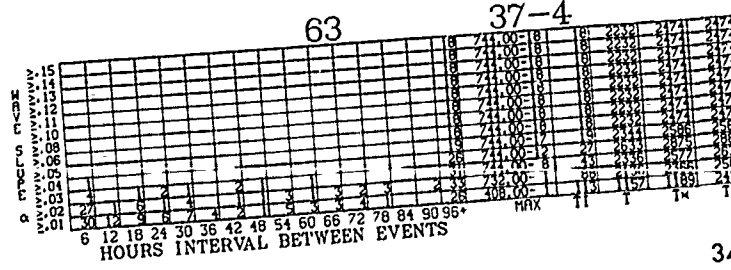
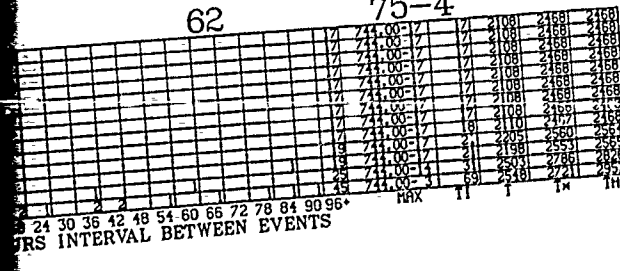
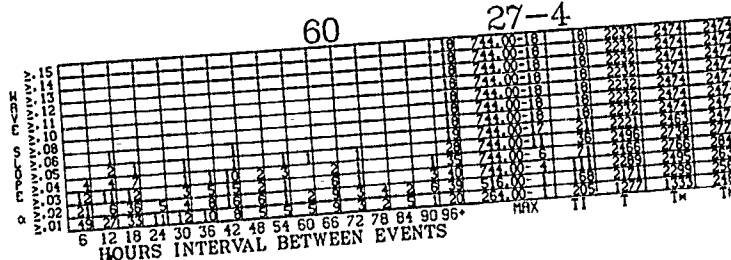
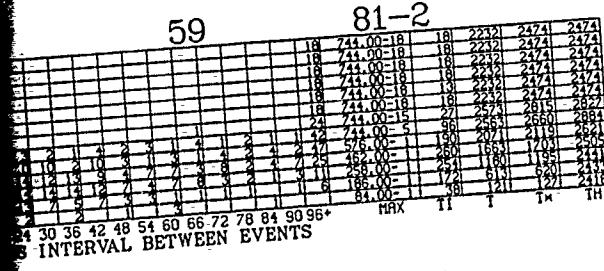
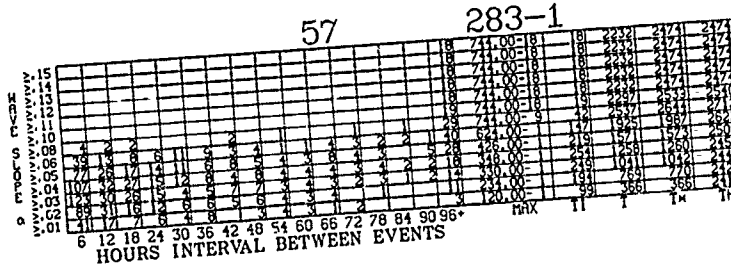
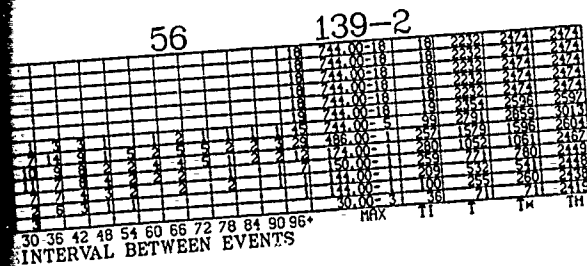
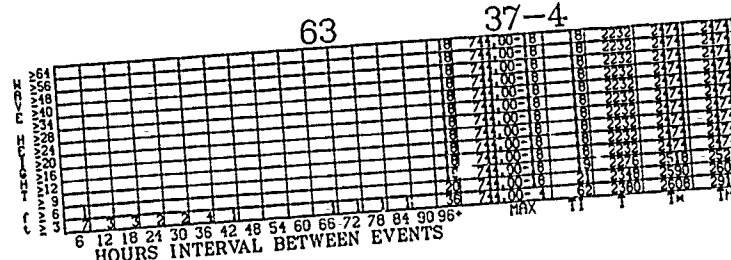
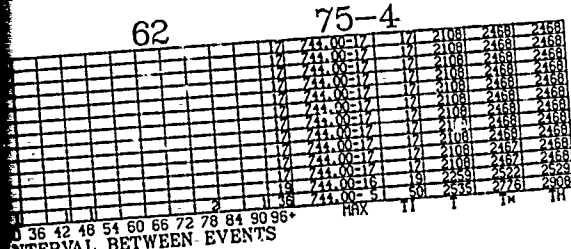
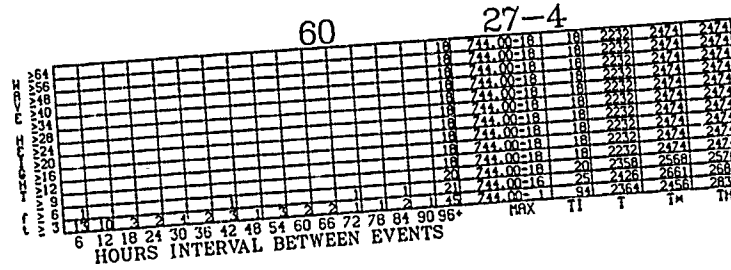
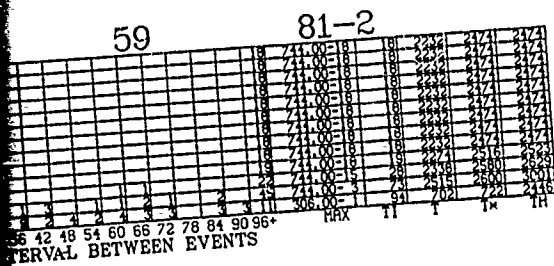
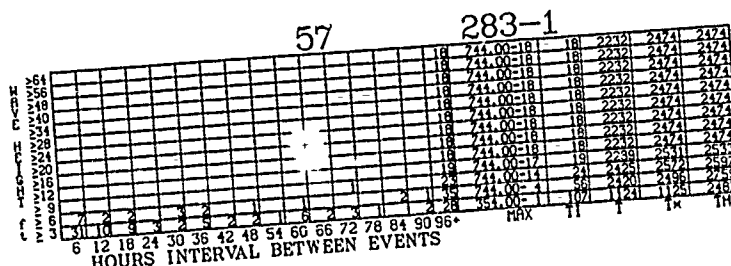
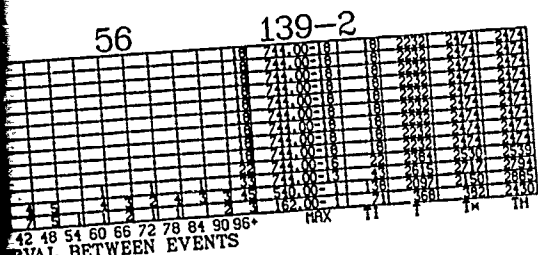
# WAVE HEIGHT AND SLOPE ( $\alpha$ ) INTERVALS (Cont'd)





LS (Cont'd)

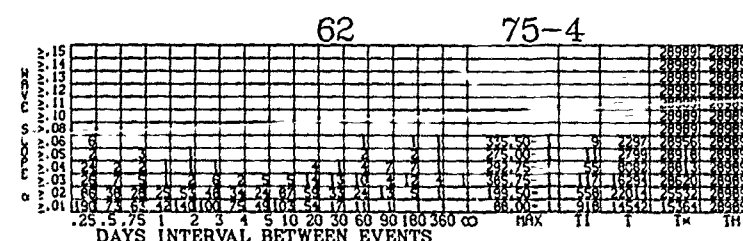
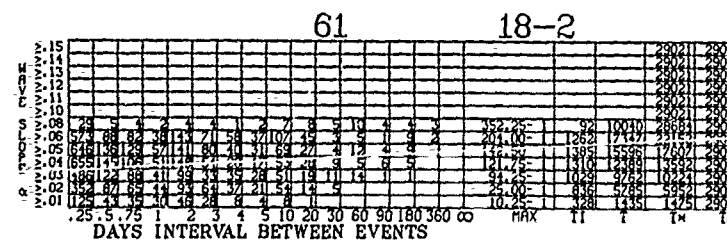
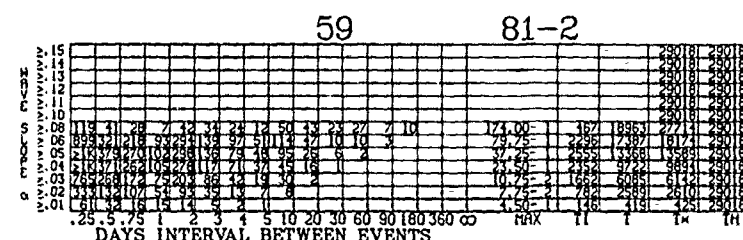
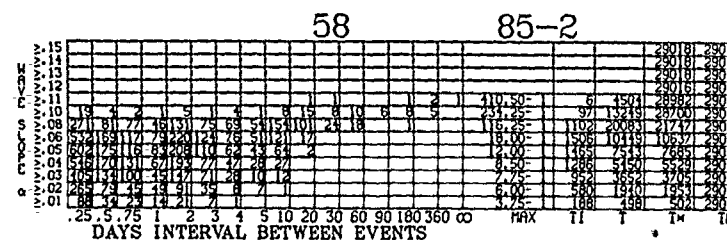
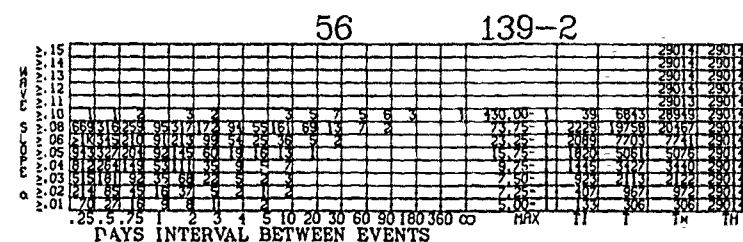
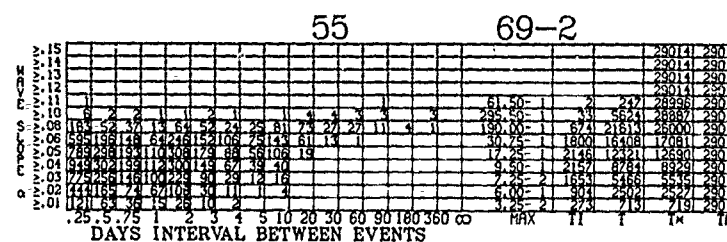
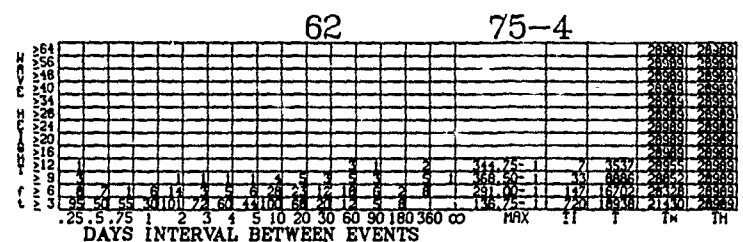
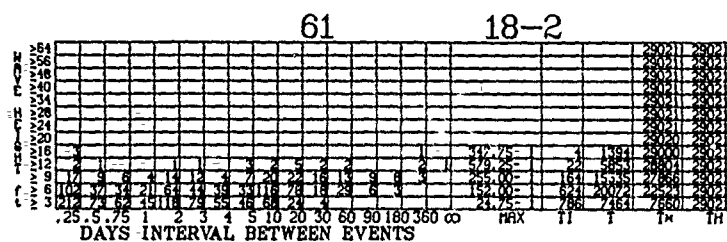
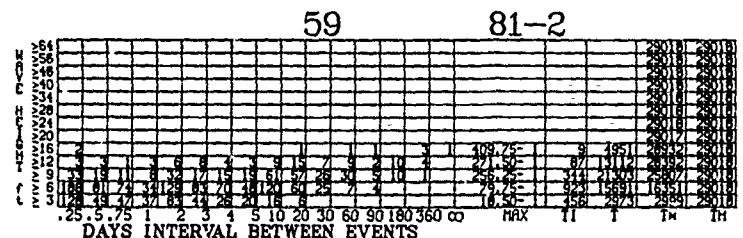
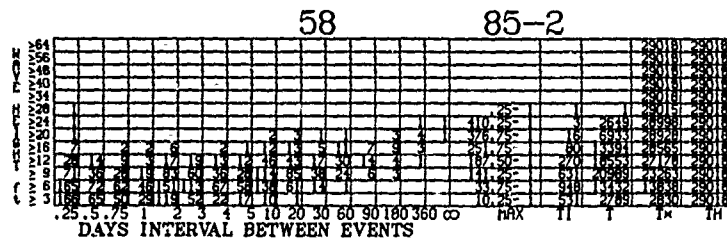
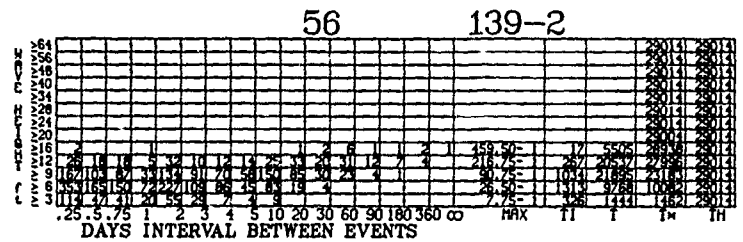
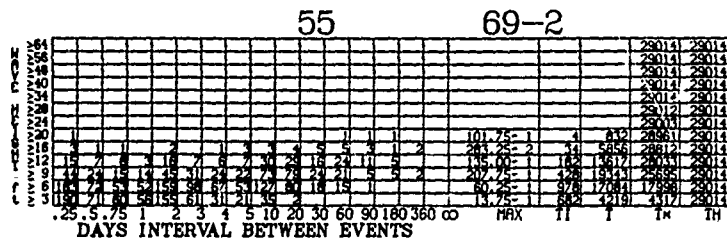
OCTOBER





# ALL DAYS

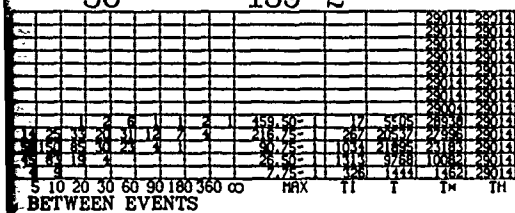
# WAVE HEIGHT AND



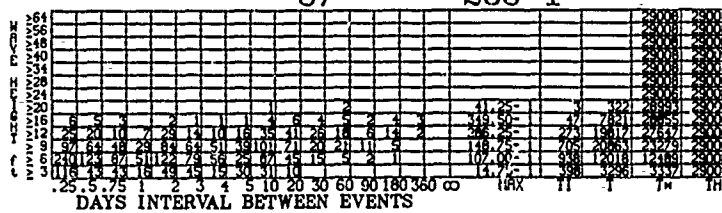
①

# WAVE HEIGHT AND SLOPE ( $\alpha$ ) INTERVALS (Cont'd)

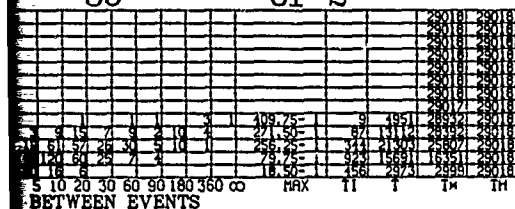
56 139-2



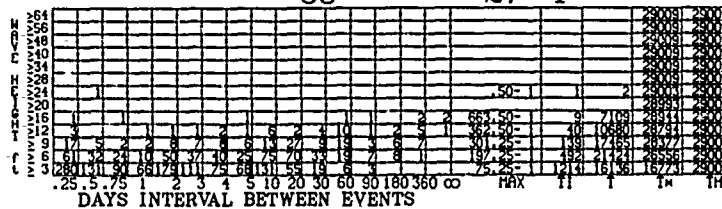
57 283-1



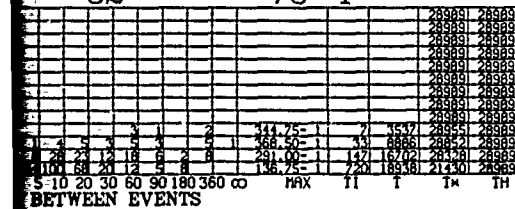
59 81-2



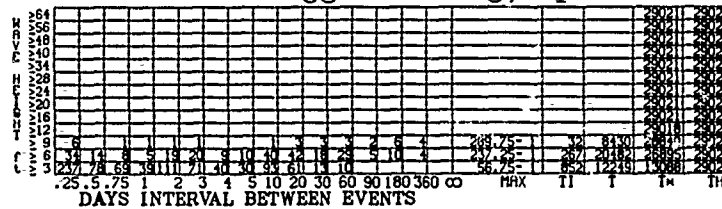
60 27-4



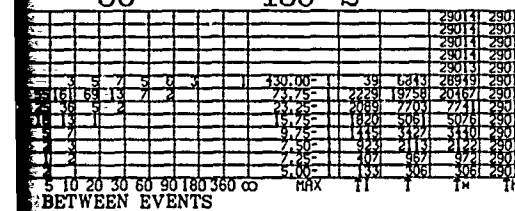
62 75-4



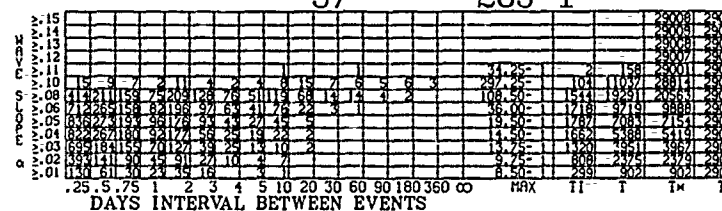
63 37-4



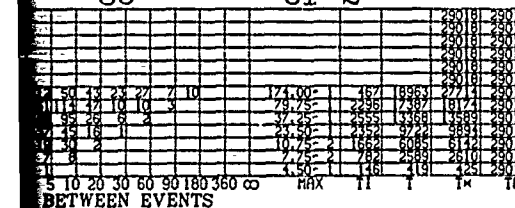
56 139-2



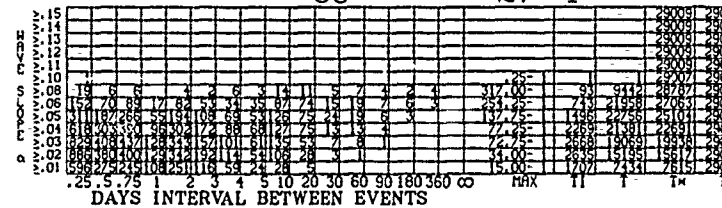
57 283-1



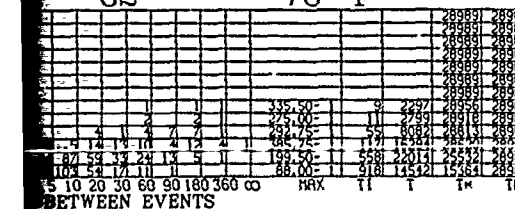
59 81-2



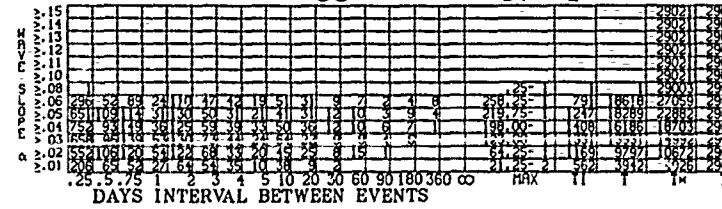
60 27-4



62 75-4



63 37-4



2

## APPENDIX A

### SOWM DEVELOPMENT

Before 1975, FLENUMOCEANCEN relied on "singular" wave models to predict wind wave, and swell heights as well as their corresponding directions and periods. The basic weakness of the "singular" models is that they do not accurately depict the complex wave propagation in the larger oceans like the Atlantic and Pacific where several wave trains can coexist in one area at any given time.

The SOWM is a wave specification and forecasting procedure that will describe the complex frequency-direction spectrum of waves in deep water with a reasonable resolution on a grid of points over the ocean. As originally planned, there were to have been four times as many grid points and twice the angular resolution for the spectra. The computer program exists for this higher resolution model, but it is not operational. Running time and memory allocation constraints made it necessary to reduce the number of grid points and decrease the angular resolution. This coarser grid can result in a misinterpretation of sub-grid scale features and fetch.

Since the SOWM is a general purpose deep-water model, it was not designed to include effects such as refraction, diffraction, shoaling, and bottom friction. As a consequence, SOWM output should be interpreted with a great deal of care for shallow water applications. Also, there are no wave-wave or wave-current interaction mechanisms; the latter have been observed to alter the wave fields in regions of a strong current like the Agulhas Current and the Gulf Stream.

The grid of points were laid out on gnomonic subprojections of an icosahedron (a solid whose surface is 20 equilateral triangles) so as to allow great circle propagation. For each of the 20 triangles, a gnomonic projection is used. Thus, a straight line with any orientation on any of the 20 subprojections is a great circle. On the sphere, the sides of the equilateral spherical triangle intersect at an

angle of  $72^\circ$  and, thus, five triangles meet at common point. On a map, the sides of equilateral triangle meet at an angle of  $60^\circ$  each triangle is plotted as a gnom projection.

The triangles are not oriented in a way relative to the latitudes and longitudes of the Earth. Instead, the icosahedron was located so as to maximize the number of vertices on land. Fig. A1 shows the 20 triangles as their vertices and edges appear on a Mercator projection<sup>1</sup>. Each triangle covers exactly same area, and the marked distortion of a Mercator projection is evident.

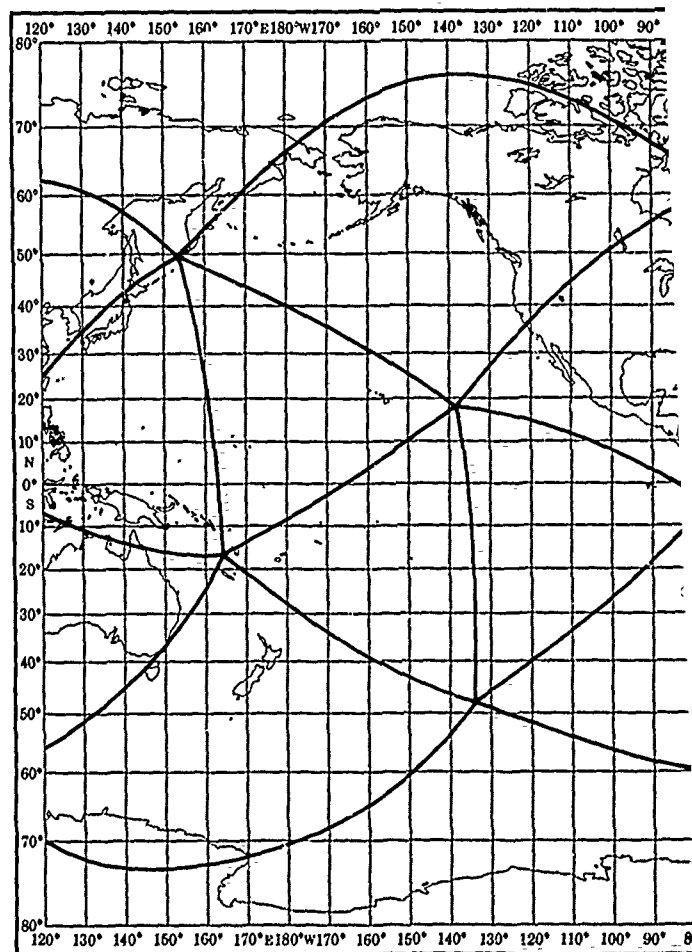


FIG. A1 The twenty equilateral triangles  
All triangles are the same size on

gle of  $72^\circ$  and, thus, five triangles meet at a common point. On a map, the sides of the equilateral triangle meet at an angle of  $60^\circ$ , if each triangle is plotted as a gnomonic projection.

The triangles are not oriented in a simple way relative to the latitudes and longitudes on the Earth. Instead, the icosahedron was located so as to maximize the number of vertices on land. Fig. A1 shows the 20 triangles as their vertices and edges appear on a Miller projection<sup>1</sup>. Each triangle covers exactly the same area, and the marked distortion of a Miller projection is evident.

Two sides of a triangle form a natural set of axes for each subprojection and the grid of points at which the SOWM spectra are computed are formed by the intersections of equally spaced lines drawn parallel to the two chosen sides of each subprojection as shown in Fig. A2. Each grid point, in principle, ought to be representative of wave spectra anywhere within the hexagon surrounding the grid point.

<sup>1</sup> A Miller projection is a cylindrical projection similar to a Mercator projection with less exaggerated spacing of the parallels at high latitudes.

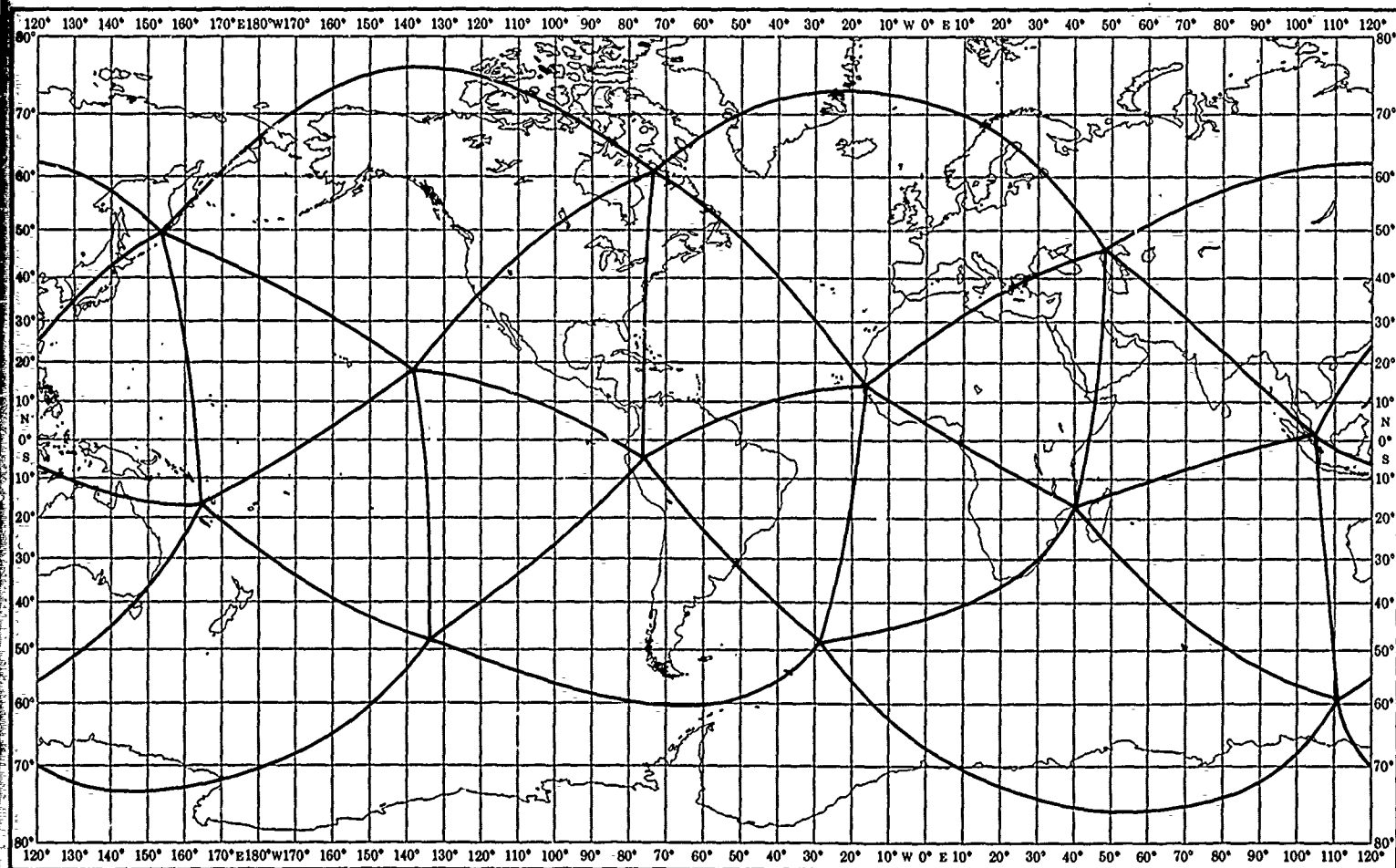


FIG. A1 The twenty equilateral triangles of the icosahedral gnomonic projection of the SOWM. All triangles are the same size on the Earth, but the Miller projection distorts them.

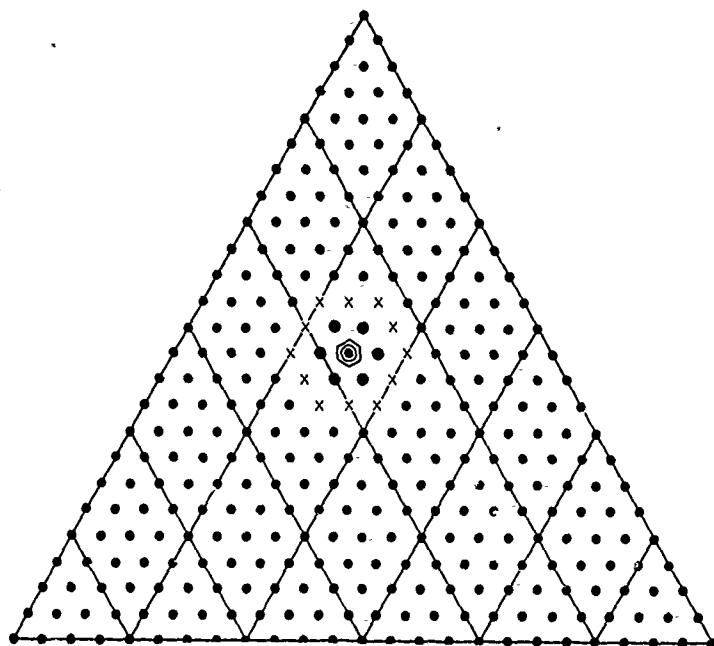


FIG. A2 The 325 grid points on a triangular gnomonic subprojection for the SOWM. Any straight line is a great circle. The hexagon around the circled dot shows the area represented by a grid point. The inner hexagon of heavy dots and the outer hexagon of X's show those grid points required to treat wave propagation effects at the circled point. (After Pierson, 1982)

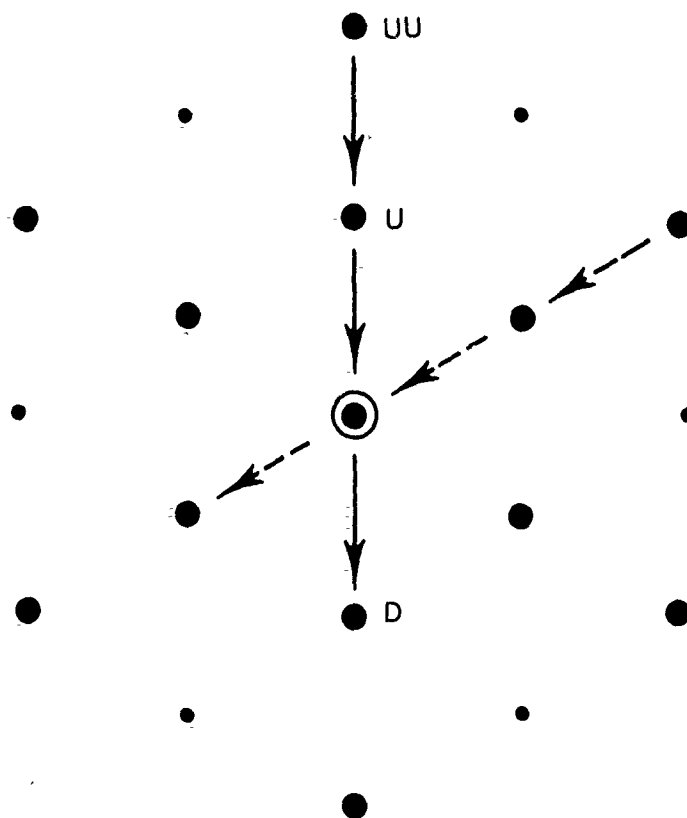
The great circle property is indicated by the fact that waves can travel to a given grid point along a great circle path from any one of the six surrounding grid points, thus accounting for six of the 12 direction bands in the model. The other six direction bands have directions of travel halfway between those for each of the primary directions. These spectral components are effectively treated as if they come from a source on the inner hexagon surrounding each grid point at a point halfway between two grid points. The distance involved is thus only about 85% of the primary distance as shown in Fig. A3.

Land boundaries and a prescribed ice limit act as sinks for spectral components. Grid points just south of the equator are treated as an artificial land boundary to provide appropriate sinks for southward moving spectral components and artificially fetch limited waves

for southerly winds at the equator. No swell from the Southern Hemisphere exists in the model, although they could be appreciable just north of the equator during the Southern Hemisphere winter. Also, there is no specific provision for tropical cyclones in the model.

Once the grid, the spectral resolution, and the time step are prescribed, the model can compute what the spectrum will be at each grid point  $x$  hours later, given an initial wave spectrum and the winds at all grid points at the time,  $t = t_0$ .

In the SOWM, this is accomplished by computing: (1) how much the wind-generated sea



#### SIX PRIMARY DIRECTIONS

FIG. A3 Grid points involved in propagation. The large dots point a downward propagating spectral component; the downstream point is shown. For secondary directions at the open circles — for one time step. The shift is

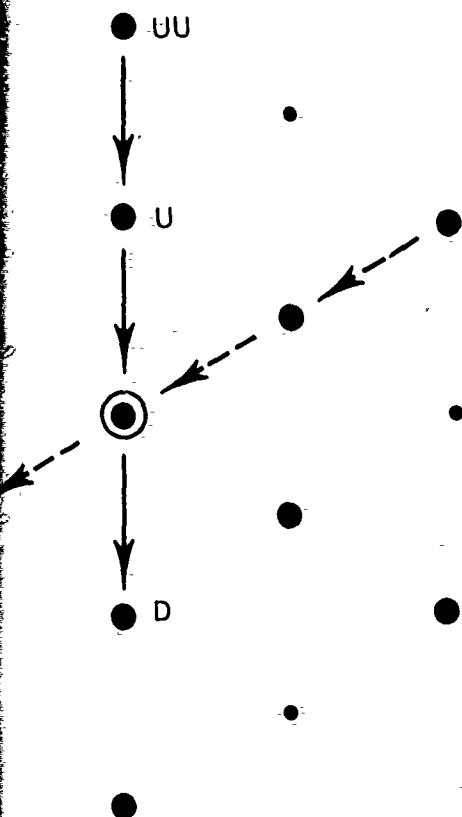
ads at the equator. No swell  
 arn Hemisphere exists in the  
 they could be appreciable just  
 equator during the Southern  
 r. Also, there is no specific  
 opical cyclones in the model.

id, the spectral resolution, and  
 re prescribed, the model can  
 spectrum will be at each grid  
 later, given an initial wave  
 winds at all grid points at the

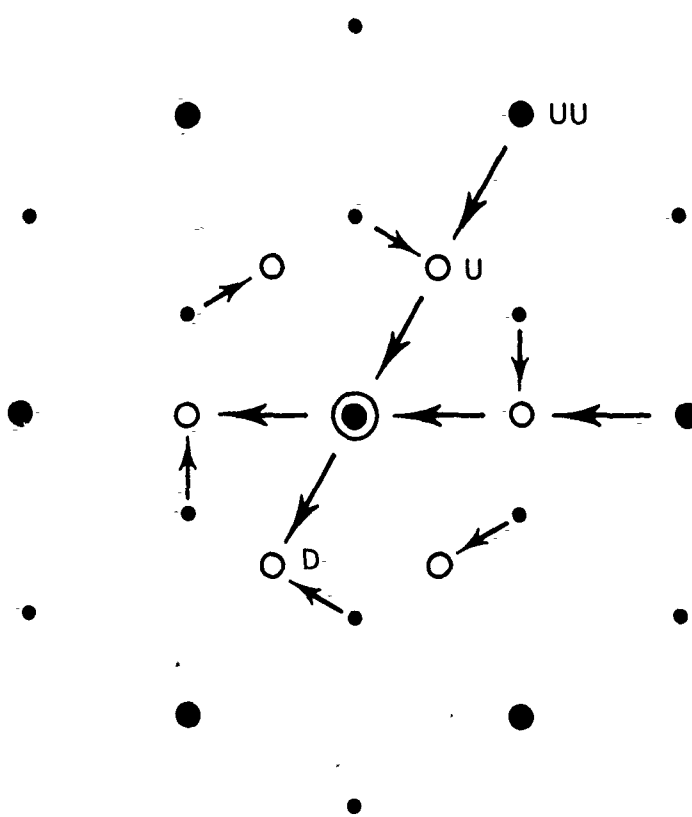
WM, this is accomplished by  
 how much the wind-generated sea

will increase or grow (if at all) during the  
 next time step at each grid point; (2) how much  
 the waves traveling against the wind ( $\pm 90^\circ$ )  
 will be dissipated; (3) how far each spectral  
 component will propagate at a representative  
 group velocity along a great circle path in  
 x hours; and, then reassembling the spectra for  
 the end of the time step.

For brevity, these steps are called Grow,  
 Dissipate, and Propagate. For the SOWM  
 hindcasts at the end of a six-hour time step,  
 within the resolution of the model, the new  
 spectra at the grid points represented the  
 waves at  $t = t + 6$  hours; new winds were then  
 used, and the processes of Grow, Dissipate, and  
 Propagate were repeated.



PRIMARY DIRECTIONS



SIX SECONDARY DIRECTIONS

oints involved in propagation. The large dots on the left are for the six primary directions. For the circled  
 downward propagating spectral component requiring an upstream point, an upper upstream point and a  
 stream point are shown. For secondary directions, the points on the inner hexagon are treated as if located  
 open circles — for one time step. The shift is reversed for the next time step. (After Pierson, 1982)



## APPENDIX B

### THE FIB TECHNIQUE

The FIB technique analyzes the distribution of a variable by blending measurements of the variable and its gradients, which come from different sources and locations. The program uses reports from various observation stations with estimates of reliability, and it accepts regional or whole field estimates of the parameter and its derivatives (gradient, laplacian, etc.). It checks all input data, rejects gross errors, and assembles the data. From this, it blends or analyzes to produce the optimum analysis which best fits all the information at hand. The technique also produces grid-point reliabilities of the final product. All input data are reevaluated individually by comparison with the blended analysis, which includes the interacting effects of all information that went into the analysis.

Reliability or weight is a measure of the worth of a piece of information. In every step of the FIB process, information exercises only that degree of influence specified by its reliability value at that particular stage of the analysis. The ability to compute information reliability is the key to the power of the FIB technique.

In the reanalysis of the 6-hourly pressure fields, missing fields were resolved by combining forward and backward kinematic extrapolation. In order to carry information along a time axis by kinematic extrapolation, a steering field was required. The 500 mb height field was used for this purpose. From the pressure fields, the wind fields (speed and direction) were computed using the algorithm originally developed by MII for FLENUMOCEANCEN for use in their singular sea/swell model. This wind algorithm was designed to be of maximum significance when used for wave generation.

A statistical analysis of computed wind speeds versus ship-observed wind speeds was conducted. Previous investigations had determined that the wind algorithm produced no systematic bias in wind direction. From a sample of 2.3 million wind observations from ships available from 1964-65, it was concluded that the computed wind speeds on the average were 1.8% low when compared to the ship-observed wind speeds. This difference was considered insignificant. However, it should be noted that the North Atlantic was treated as a whole, thereby possibly smoothing large deviations in relatively small areas or large deviations of opposite sign. Appendix F provides additional information regarding possible biases in wind speeds.

## APPENDIX C

### PARAMETER DERIVATIONS

The output from a SOWM hindcast includes a directional variance spectrum at each grid point as represented by 12 equally divided direction bands and 15 frequency bands of varying widths as depicted in Tables C1 and C2. The direction bands are unique for each grid point, but the frequency bands remain constant for all grid points (Table C2). The lowest possible frequency in a SOWM spectrum is 0.0390 Hz which corresponds to a period of 25.6 seconds.

Conversely, the highest frequency is 0.308 Hz which corresponds to a period of 3.24 seconds. The SOWM generates 'energy variances' in each cell within the 180 element matrix from input wind fields. There is a certain amount of confusion inherent in the terminology 'energy variances' since the values within each cell are not energies. It is necessary to digress somewhat to appreciate the roots of this terminology.

In a steady Sea State the record of the waves (a continuous time series of the rise and fall of the sea surface at a point) does not

TABLE C1  
AN EXAMPLE OF A DIRECTIONAL VARIANCE SPECTRUM

Wind Direction = 160° Wind Speed = 21.5 kn

Central Frequency (hz)

Direction (deg)	.308	.208	.158	.133	.117	.103	.092	.081	.072	.067	.062	.056	.050	.044	.039	Directional Total
96.6																
66.6																
36.6																
6.6																
336.6																
306.6																
276.6				.01	.06	.10	.15	.42	.15	.02		.02				.93
246.6	.04	.13	.18	.13	.13	.11	.05	.03	.01			.01				.82
216.6	.06	.20	.35	.29	.33	.18	.06	.02								1.49
186.6	.06	.20	.37	.30	.28	.01	.09	.02								1.33
156.6	.04	.14	.20	.14	.12	.01	.03	.01								.69
126.6	.03	.08		.04	.03											.18
Frequency Spectrum	.23	.75	1.10	.91	.95	.41	.38	.50	.16	.02		.03				5.44 Total (ft <sup>2</sup> )

Derived parameters:  $\bar{H}_{m_0} = 9.3$  ft.,  $T_p = 8.57$  s.,  $\alpha = 0.085$ ,  $PWD = 212^\circ$ ,  $\rho_c = 0.77$

There is a certain amount of difference in the terminology 'energy' since the values within each cell are different. It is necessary to digress a little to appreciate the roots of this

repeat itself exactly from one wave to the next because the waves are a superposition of sinusoids with many different frequencies and directions of travel. Every wave record of finite length as a function of time, however, can be decomposed into harmonics. The zeroth harmonic is the mean elevation of the sea and is assumed to be zero for the analysis since the contributions from much longer periods such as the tides are constants during the time of observation. The first harmonic, is a least squares fit of a sinusoid with a period equal to the wave record with its peak positioned such that its amplitude is maximized. The first

body Sea State the record of the continuous time series of the rise and sea surface at a point) does not

# SPECTRUM

1.5 kn

.062	.056	.050	.044	.039	Directional Total
	.02				.93
	.01				.82
					1.49
					1.33
					.69
					.18
	.03				5.44 Total (ft <sup>2</sup> )

$$\rho_c = 0.77$$

TABLE C2

**BAND NUMBER, BAND WIDTH, CENTRAL FREQUENCY  
(AS A FRACTION AND A DECIMAL), PERIOD, AND  
BANDWIDTH BOUNDS (After Pierson, 1982)**

Band Number	Band Width x 180	Central Frequency	Central Frequency	Period	Lower Bound x 180	Upper Bound x 180
1	24	55.5/180	0.30833̄	3.24	43.5	67.5
2	12	37.5/180	0.20833̄	4.8	31.5	43.5
3	6	28.5/180	0.15833̄	6.32	25.5	31.5
4	3	24.0/180	0.13333̄	7.5	22.5	25.5
5	3	21.0/180	0.11666̄	8.57	19.5	22.5
6	2	18.5/180	0.10277̄	9.73	17.5	19.5
7	2	16.5/180	0.09166̄	10.91	15.5	17.5
8	2	14.5/180	0.08055̄	12.4	13.5	15.5
9	1	13.0/180	0.07222̄	13.85	12.5	13.5
10	1	12.0/180	0.0666̄	15.0	11.5	12.5
11	1	11.0/180	0.06111̄	16.4	10.5	11.5
12	1	10.0/180	0.0555̄	18.0	9.5	10.5
13	1	9.0/180	0.0500̄	20.0	8.5	9.5
14	1	8.0/180	0.0444̄	22.5	7.5	8.5
15	1	7.0/180	0.0388̄	25.7	6.5	7.5

harmonic has one maximum and minimum for the entire wave record. The second harmonic has a period of one-half the wave record with its two peaks positioned such that it too has maximum amplitude. Each subsequent harmonic can be thought of as a least squares fit of a sinusoid with the number of peaks and valleys (or the period) increasing (decreasing) corresponding to the harmonic number. By adding each new harmonic to the preceding harmonics, the harmonics or the 'Fourier Series' begin to resemble the wave record. If the number of observations on the wave record is N, then N/2 harmonics will completely describe the wave record.

The average energy in the wave motion per unit area is described by:

$$E = \frac{1}{2} \rho g a^2 \quad (C1)$$

where  $\rho$  is the density of the ocean water,  $g$  is the acceleration of gravity, and  $a$  is the wave amplitude. Half of the energy is kinetic, and the other half is potential.

Recalling that each wave record can be decomposed into a number of harmonics, then if the amplitude of each harmonic is squared, multiplied by  $(\frac{1}{2} \rho g)$ , and plotted on a graph as the ordinate using the associated frequency or period of the harmonic as the abscissa, the resulting graph is a 'wave energy spectrum.' Initially it was customary to present the spectrum in this manner (World Meteorological Organization, 1976), but since the magnitude of the right-hand side of Eq. C1 is dominated by  $(a^2)$  the multiplication of  $(\rho g)$  is now omitted. This is the format of the data generated in the SOWM hindcasts. Each cell in Table C1 can be summed to yield the quantity  $(1/2a^2)$ . The omission of  $(\rho g)$  transforms the 'wave energy spectrum' into an 'energy variance spectrum' or more appropriately 'variance spectrum,' since the sum of each cell in Table C1 will equal the variance of the spectrum of the wave record it is representing. Likewise, the area under a variance spectrum curve as derived from the frequency spectrum totals in Table C1 will equal the variance of the spectrum represented.

## WAVE HEIGHT

In Table C1 each quantity within the cells of the table has units of  $\text{ft}^2$ , and cells with any values contain component variances less than 0.01  $\text{ft}^2$ . Such small values were considered insignificant, and were not retained in the output generated from the SOWM hindcast. The total variance of each spectrum can be converted to a spectral wave height parameter ( $H_{m0}$ ) which closely corresponds to the significant wave height ( $\bar{H}_{1/3}$ ). The significant wave height of a wave record is defined as the average height of the highest one-third of the wave heights. The quantity  $(\bar{H}_{1/3})$  has been shown to roughly approximate the characteristic wave height observed visually (Cartwright, 1969; Nordenstrom, 1969). The spectral wave height parameter ( $H_{m0}$ ) from Rayleigh statistics is defined as:

$$H_{m0} = 4 (m_0)^{1/2} \quad (C2)$$

where  $m_0$  is the sum of the component variances of all cells of Table C1. The quantity  $(m_0)$  is commonly referred to as the moment of order zero. The correspondence between  $H_{m0}$  and  $\bar{H}_{1/3}$  is strictly valid for a spectrum with most of its energy or variance concentrated over a narrow range of frequencies, but is an approximation in the cases with a broad spectrum. This approximation is sufficiently close for most practical applications (World Meteorological Organization, 1976).

## WAVE PERIOD

The choice of the modal or peak wave period ( $T_p$ ) is based upon the 'variance densities' of the point spectrum. 'Variance densities' with dimensions of  $\text{ft}^2\text{-sec}$  are obtained by dividing the variances by the frequency bandwidth. In the SOWM the bandwidths vary in size from 0.00560 to 0.1333 Hz. After dividing by the bandwidth, the energies are standardized with respect to one another.  $T_p$  can then be obtained by choosing the central frequency, the corresponding period, associated with the peak variance density. In Table C1,  $T_p$  is associated with the central frequency of 0.117 Hz, which equates to a period of 8.5 seconds. The problem

## WAVE HEIGHT

In Table C1 each quantity within the cells of the table has units of  $\text{ft}^2$ , and cells without values contain component variances less than  $\text{ft}^2$ . Such small values were considered insignificant, and were not retained in the output generated from the SOWM hindcast. The variance of each spectrum can be converted to a spectral wave height parameter ( $H_{m0}$ ) which directly corresponds to the significant wave height ( $H_{1/3}$ ). The significant wave height on a record is defined as the average height of the highest one-third of the wave heights. The quantity ( $H_{1/3}$ ) has been shown to roughly approximate the characteristic wave height observed visually (Cartwright, 1964; Jenstrom, 1969). The spectral wave height parameter ( $H_{m0}$ ) from Rayleigh statistics is defined as:

$$H_{m0} = 4 (m_0)^{1/2} \quad (C2)$$

where  $m_0$  is the sum of the component variances of all cells of Table C1. The quantity ( $m_0$ ) is commonly referred to as the moment of order zero. The correspondence between  $H_{m0}$  and  $H_{1/3}$  is strictly valid for a spectrum with most of its energy or variance concentrated over a narrow range of frequencies, but the approximation in the cases with a broader spectrum is sufficiently close for most practical applications (World Meteorological Organization, 1976).

## WAVE PERIOD

The choice of the modal or peak wave period is based upon the 'variance densities' of a point spectrum. 'Variance densities' with dimensions of  $\text{ft}^2\text{-sec}$  are obtained by dividing the variances by the frequency bandwidth. In the SOWM the bandwidths vary in size from 0.560 to 0.1333 Hz. After dividing by the bandwidth, the energies are standardized with respect to one another.  $T_p$  can then be obtained by choosing the central frequency, or the corresponding period, associated with the peak variance density. In Table C1,  $T_p$  is associated with the central frequency of 0.117 Hz, which translates to a period of 8.5 seconds. The problem

associated with an ill-defined modal period of a specific spectrum, as occurs when there is only a small difference between the variance densities of two or more frequency bands, is minimized due to the large number of spectra included in the summaries presented in this atlas.

## WAVE SLOPE

The slope associated with very high waves is considered by many ship designers to be a major contribution to operational failures. The wave slope is often estimated using the ratio of the wave height ( $H$ ) to the wave length ( $L$ ). However, the relationship usually used to obtain the wave length:

$$L = 5.12T^2 \quad (C3)$$

where  $T$  is the wave period in seconds and  $L$  is the wave length in feet is valid only when the wave is a simple periodic sine wave. Pierson (1955) clearly states that Eq. C3 does not hold for the irregular sea surface. The assumptions under which Eq. C3 was derived are violated outside of the wave tank. An alternative method of estimating the wave slope is needed. Since the SOWM provides a frequency spectrum of wave energy this information is used directly in this atlas to calculate a wave slope parameter ( $\alpha$ ).

The wave slope parameter,  $\alpha$ , is defined by:

$$\alpha = (m_4)^{1/2} / g \quad (C4)$$

where  $m_4$  is the moment of order four (the fourth moment). The moments are defined by:

$$m_n = \sum_{i=1}^K V_i \omega_i^n \quad (C5)$$

where  $\omega$  is the circular frequency,  $n$  is the order of the moment,  $V_i$  is a component variance, and  $K$  is the number of frequency bands. The parameter  $\alpha$  is the root mean square of the absolute slope at any fixed point. Cummins and Bales (1980) derived the wave slope parameter  $\alpha$ . It should be noted that  $\alpha$  is more strongly influenced by the shorter, higher frequency components of the spectrum than by the

larger, longer, but not so steep waves near the modal frequency. Thus, a "rough sea" as measured by  $\alpha$ , does not necessarily imply a "high sea." Information regarding the significance of its range of values can be calculated from the derivation of the root mean square wave slope of a regular wave. The resulting equation is (Gentile, 1982):

$$\alpha = \sqrt{\frac{\pi}{2}} \frac{H_w}{L_w} \quad (C6)$$

where  $H_w$  is the wave height (crest to trough) and  $L_w$  is the wave length. Information in Table C3 is based upon Eq. C6.

TABLE C3

APPROXIMATE VALUES OF WAVE LENGTH  
TO WAVE HEIGHT FOR ASSOCIATED VALUES  
OF THE WAVE SLOPE PARAMETER ( $\alpha$ )

Wave Slope Parameter ( $\alpha$ )	Ratio Wave Length (L) to Wave Height (H)	Angle of Wave Slope $\tan^{-1} (H/L)$
0.01	222.0	0.3°
0.02	111.0	0.5°
0.03	74.0	0.8°
0.04	55.5	1.0°
0.05	44.4	1.3°
0.06	37.0	1.5°
0.08	27.8	2.1°
0.10	22.2	2.6°
0.11	20.2	2.8°
0.12	18.5	3.1°
0.13	17.1	3.3°
0.14	15.9	3.6°
0.15	14.8	3.9°

## PRIMARY WAVE DIRECTION AND DIRECTIONALITY

The primary wave direction (PWD) and directionality ( $\rho_c$ ) are two parameters which derived from the directional spectrum totals opposed to the frequency spectrum totals. definition of the PWD is taken directly from FLENUMOCEANCEN's 1981 version of the operational SOWM computer program (Lazano 1981). The PWD is determined by a multi-s process. First, the maximum variance ( $V_m$ ) the directional totals is identified, where  $m$  one of the twelve directional bands. Next, following true-false tests are performed sequence.

$$V_m > \sqrt{2} \left[ \sum_{i=1}^{12} V_i \right] i \neq m \quad (C7)$$

$$V_{m,m+1} > \sqrt{2} \left[ \sum_{i=1}^{12} V_i \right] i \neq m \quad (C8)$$

$$V_{m,m+1,m-1} > \sqrt{2} \left[ \sum_{i=1}^{12} V_i \right] i \neq m \quad (C9)$$

where  $i$  is one of the 12 directional bands,  $V_{m+1}$  is the higher of the two adjacent directional variances.

If Eq. C7 is true, then the PWD is  $i$



## VE DIRECTION AND CTIONALITY

the direction (PWD) and the variance are two parameters which are calculated from the directional spectrum totals as well as the frequency spectrum totals. The PWD is taken directly from the 1981 version of their computer program (Lazanoff, 1981), determined by a multi-step process. The maximum variance ( $V_m$ ) in the 12 directional bands is identified, where  $m$  is the band number. Next, the following tests are performed in

direction associated with  $V_m$ . If C7 is false, Eq. C8 is tested; and thusly for Eq. C9. For the first successful test of Eq. C8 or C9, the vectors defined by the directions and variances of the quantities on the left-hand side of the inequalities are summed and the resultant direction defined as the PWD. If Eq. C9 is false, then the PWD is not defined, and a confused sea state is assumed. The methodology used for defining the PWD is somewhat arbitrary, but the technique has proved quite useful operationally (Lazanoff, 1981).

The degree of directionality is defined by:

$$\rho_c = (\rho_x^2 + \rho_y^2)^{1/2} \quad (C10)$$

where

$$\rho_x = (1/m_o) \sum_{i=1}^{12} V_i \sin \theta_i \quad (C7)$$

$$\rho_c = (1/m_o) \sum_{i=1}^{12} V_i \sin \theta_i \quad (C11)$$

$$\rho_y = (1/m_o) \sum_{i=1}^{12} V_i \cos \theta_i \quad (C8)$$

$$\rho_y = (1/m_o) \sum_{i=1}^{12} V_i \cos \theta_i \quad (C12)$$

$$\rho_c = (1/m_o) \sum_{i=1}^{12} V_i \quad (C9)$$

the 12 directional bands, and for each of the two adjacent bands.

If true, then the PWD is the

The angle  $\theta$  is the direction associated with the variances in the directional spectrum totals. The directionality has a value of one for an unidirectional sea state, and a value of zero when there is a completely symmetric distribution of variance around the compass. This parameter has the same properties as the 'constancy' parameter, often used in climatological wind summaries.

# APPENDIX D

## SOME APPLICATIONS OF CONTINGENCY TABLES

1. Question: What is the Climatological probability of having wave heights less than 20 ft at 62°N, 4°W in November?

Sample Application: A war at sea exercise is planned for 10 through 19 November at 62°N, 4°W. In order to complete all phases of the exercise within the 10 day period available, at least 7 days (not necessarily consecutive) with significant wave heights less than 20 feet are needed. Based on climatology, will 10 days probably be enough time to complete all phases of the exercise?

Answer: Proceed to the November wave height and wind speed contingency table for the grid point nearest to 62°N and 4°W. From Table 1 or Fig. 1 (North Atlantic map) we find that this is the contingency table for sequence number 5. (For illustrative purposes the contingency table from the "Legends for Tables" is used in the following solution.) The climatological probability of having wave heights <20 ft can be found by adding the percent frequency of occurrences in the "T" or total column for wave heights <20 ft. The result is  $2+3+9+14+20+17 = 65\%$ . This means that on the average 65% of the time waves less than 20 ft will be encountered during November. Since 10 days have been allowed for the exercise on average  $10 \times .65 = 6.5$  days will have significant wave heights less than 20 ft. Thus based on

climatology, 10 days probably not be enough to complete the exercise. However, if the exercise period could be extended to 11 days, on an average  $7.2$  days ( $.65 \times 11$ ) would be less than 20 ft waves and the exercise could probably be completed.

2. Question: How can the tables be utilized to predict the efficiency of a vessel, system, or operation in a given area and time of year?

Answer: Operational enhancement through environmental tuning may be realized through the following procedure:

- (a) Identify the desired acceptable joint frequency of occurrence for the parameter(s) of interest, i.e., wave height, wind direction, wave height, wave slope, etc.
- (b) Extract the joint probability frequency of occurrence for parameter(s) of interest from appropriate contingency table for the desired time interval (month, season, or annual), for the area(s) of interest.
- (c) Derive probabilities of efficiency by determining the percent of the time that identified environmental conditions fall within desired operable limits.

3. Question: How can the tables be used to assess how the environment may have been a contributing factor in the failure or damage to a system, operation, or equipment? (Note: This does not pertain to failures due to a specific episode, but rather to failures which result from cumulative stresses over a significant portion of the system's "lifespan").

①

climatology, 10 days will probably not be enough time to complete the exercise. However, if the exercise period could be extended to 11 days, on average 7.2 days (.65 X 11) would have less than 20 ft waves and the exercise could probably be completed.

Question: How can the tables be utilized to predict the efficiency of a vessel, system, or operation, for a given area and time of the year?

Answer: Operational enhancement by environmental tuning may be realized through the following procedure:

(a) Identify the desired acceptable joint frequency of occurrence for the parameters of interest, i.e., wave height and wind direction, wave height and wave slope, etc.

(b) Extract the joint percent frequency of occurrence for the parameter(s) of interest from the appropriate contingency table for the desired time interval (month, season, or annual), for the area(s) of interest.

(c) Derive probabilities of efficiency by determining the percent of the time that the identified environmental conditions fall within the desired operable limits.

Question: How can the tables be used to assess how the environment may have been a contributing factor in the failure or damage of a system, operation, or equipment? (Note: This does not pertain to failures due to a specific episode, but rather to failures which result from cumulative stresses over a significant portion of the ship's "lifespan").

Answer: Inputs to assess environmental impact on a system of operation may be gathered by:

(a) Identify the area(s), time (month) of failure or damage.

(b) Identify the wind and wave conditions which if exceeded would probably cause damage or failure.

(c) Derive the percent of occurrence of conditions, exceeding those conditions identified in Step 2, for the corresponding area(s) and time (Silver and Bales, 1983).

4. Question: How can these tables assist in ship design?

Answer: For example, U. S. Navy ship designers follow four steps when applying the information contained in this atlas to design.

(a) Define the mission of the vessel, and determine the significant wave heights in which the mission must be performed at required levels of efficiency.

\*EXAMPLE\*

Mission	Maximum Allowable Ship Motion	Significant Wave Height
Operation of Aircraft	5° roll	<13 ft (4m)
Continuous Total Mission	10° roll	13-20 ft (4-6m)
Limited Operation	15° roll	20-30 ft (6-9m)
Survivability	N/A	>46 ft (14m)

(b) Identify the area(s) of operation.

(c) Extract wave height percent of occurrences from the Wave Height and Modal Wave Period Contingency Table for the appropriate area(s). This can be done monthly and annually.

(d) To calculate ship responses derive the percentage of successful, limited, and unsuccessful mission operation by using the percent frequencies of occurrence of the significant wave height operating envelopes with the joint frequencies of occurrence of significant wave height and modal wave period (Bales, 1983; Comstock, Bales, and Gentile, 1982). If the percentages of success derived in Step (d) are unsatisfactory for operating specifications the designer must fine tune the vessel's hull configuration to meet the operating envelope.

5. Question: How can these tables be utilized in planning a ship trial?

Answer: Ship trial planning can be enhanced through the use of this atlas by following a procedure similar to that used by the ship designer to identify areas of the ocean likely to provoke the desired ship motions at a given time of the year.

(a) The first step is to define the seaway (upper and lower wave height limits) best suited for specific tasks of the ship trial.

(b) Identify the general geographic area of the trial.

(c) Identify the times (months) which have acceptable probability (e.g., 50%, 75%, 80%, etc.) of occurrence of the desired wave heights. Probabilities of occurrence can be derived by extracting the wave height from the wave height contingency tables.

## APPENDIX E

### DURATION AND INTERVAL TABLES

In the monthly tables, durations and intervals that are underway at the beginning of a month are treated as if they began on the first day of the month. The other alternative, going backwards in time into the previous month to search for the actual beginning time, was considered less appropriate for planning purposes. When a mobile platform (ship) arrives at a location at some arbitrary time, the duration of the current episode previous to the ship's arrival is not usually important. The ship is affected only by the number of hours the episode is likely to continue for the time the ship remains in that vicinity. It is not particularly important that the beginning of a month was used for the start-up of duration or interval frequencies, whereas, actual operations may be scheduled to begin at times other than the beginning of the month; episodes are likely to occur in a near-random manner through the course of specific months. In terminating durations and intervals, episodes that carried beyond the end of the month were counted until they actually ended or they continued for more than one month (the number of days corresponding to the number of days in the month in which episode began), whichever occurred first. This prevents episodes from becoming artificially short simply due to the ending of the month. For example, if a plan calls for a ship to be at a specific location near the end of the month and remain in that vicinity for several days into the next month, the planner only needs to check the table for the month in which he plans to arrive and not a subsequent table for some later month.

In the summary tables covering all months of data, durations and intervals that are underway at the beginning and end of the period of record are not counted. These summary tables represent the wind or wave environment at a fixed position over the 20-year hindcast period. By assuming a stable climate and using appropriate statistical procedures, these tables

can be used to estimate conditions which would affect a fixed platform for the expected lifetime of the platform at a fixed position.

Missing data were not replaced with estimated values. When missing data were encountered, the ongoing and subsequent episodes were excluded from the duration and interval frequencies. This tends to reduce the number of very long-duration events common to the summary tables covering all months. It has little effect on the statistics for shorter duration phenomena more typical of the monthly summaries.

Definitions of column trailers in the duration and interval tables (see 'Legends for Tables') are as follows:

- MAX: The maximum duration (or interval) in hours, followed by the number of times an episode of that length occurred. The abbreviation "MO" in the monthly tables represents episodes that lasted one month or longer.
- TE: The number of events satisfying the stated criteria. An event begins with the wind speed, wave height or slope increasing to the given threshold.
- TI: The number of intervals. These are episodes not satisfying the stated criteria. An interval begins with the wind speed, wave height or slope falling below the given threshold.
- T: The total number of hindcasts that were included in (TE) or (TI).
- T\*: The total number of hindcasts that met the stated criteria. This is more than T if missing data made the duration or interval impossible to determine. It can be used to determine the probability of encountering the conditions specified (by

be used to estimate conditions which would affect a fixed platform for the expected lifetime of the platform at a fixed position.

Missing data were not replaced with estimated values. When missing data were encountered, the ongoing and subsequent episodes were excluded from the duration and interval frequencies. This tends to reduce the number of very long-duration events common to the summary tables covering all months. It has little effect on the statistics for shorter duration phenomena more typical of the monthly summaries.

Definitions of column trailers in the duration and interval tables (see 'Legends for Tables') are as follows:

- MAX: The maximum duration (or interval) in hours, followed by the number of times an episode of that length occurred. The abbreviation "MO" in the monthly tables represents episodes that lasted one month or longer.
- TE: The number of events satisfying the stated criteria. An event begins with the wind speed, wave height or slope increasing to the given threshold.
- TI: The number of intervals. These are episodes not satisfying the stated criteria. An interval begins with the wind speed, wave height or slope falling below the given threshold.
- T: The total number of hindcasts that were included in (TE) or (TI).
- T\*: The total number of hindcasts that met the stated criteria. This is more than T if missing data made the duration or interval impossible to determine. It can be used to determine the probability of encountering the conditions specified (by

computing  $T^*/TH$ ).

TH: The total number of hindcasts examined.

If the number of the 'duration of events' or 'intervals between events' exceeds 999, the symbol 'K' is used to denote thousands, and the '>' symbol is used to denote greater than or equal to. For example, >1K implies greater than or equal to 1,000 durations or intervals. In order to correctly interpret the tabulations, specific examples of the various types of duration and interval tables are provided in the 'Legends for Tables.'

When answering questions using the duration and interval tables, it is important to distinguish between questions that require the use of the number of episodes and those that require the number of hindcasts. Answers for questions regarding the percentage of time at or above, or below, certain thresholds require the use of the number of hindcasts. On the other hand, questions concerned with the percentage of episodes at or above, or below, certain thresholds demand the use of episode frequencies, where a one-day episode and a 60-day episode will each count as one episode.

The following examples are provided to illustrate applications of the tables. The numbers in the examples are extracted from the sample tables in the legends. Regardless of the type of parameter used (wind speed, wave height or slope), the procedures are not altered.

## APPLICATIONS OF DURATION AND INTERVAL TABLES

1. Question: Of all the events with winds of 34 knots or more during a particular month, what percentage had durations of longer than one day?

Sample Application: Winds have just increased to gale force (34 knots or more) at a ship's location. What is the climatological probability that the gale force



winds will persist longer than one day?

Answer: The number of events (or episodes)  $>34$  knots is 39 (from the TE column of the duration table in the 'Legends for Tables'). The number of events of winds  $>34$  knots lasting more than one day is  $1 + 3 + 1 + 1 = 6$ . The percentage of events with winds  $>34$  knots lasting one day more is thus  $6 \div 39 \times 100\% = 15.4\%$ .

2. Question: What percentage of the time during a particular month can waves greater than or equal to 20 ft be expected to persist longer than 24 hours?

Sample Application: Carrier flight operations have been scheduled for a specified operating area during a particular month. Flight operations need to commence within 24 hours of arrival within the operating area. They cannot be conducted if the significant wave height is 20 ft or more. What is the climatological probability that the carrier will be unable to conduct flight operations in the operating area for more than 24 hours due to high seas?

Answer: This problem involves computations using hindcasts from the monthly duration table rather than episodes from the duration table since we are answering a question regarding the percentage of time. The solution can be found by computing the joint percentage as follows: (percent of waves  $>20$  ft times percent of  $>20$  foot waves that persist longer than 24 hours). Note that the percent of  $>20$  foot waves that lasted  $<24$  hours plus the

percent of  $>20$  foot waves that lasted  $>24$  hours is 100% so we can compute whichever is easier and subtract from 100% if necessary. Percentages are used because of the difference between T and T\* caused by missing data. Step 1. Compute the percent of  $>20$  foot waves that lasted  $>24$  hours. In this example it will be easier to find the percent for  $<24$  hours then subtract from 100% to obtain the percent we require. This requires the calculation of the total number of hindcasts meeting this criterion.

This procedure is as follows:

Duration	Hindcasts Per Event	Frequency (From Table)	Hindcasts $\geq 20$ ft Lasting $\leq 24$ Hours
6 hours	1	X 7	= 7
12 hours	2	X 2	= 4
18 hours	3	X 8	= 24
24 hours	4	X 7	= 28
TOTAL:			63

Thus, the percent of  $>20$  foot waves that lasted  $<24$  hours is  $(63 \div 175) \times 100\% = 36.0\%$ . The percent of  $>20$  foot waves lasted  $>24$  hours is  $100\% - 36.0\% = 64.0\%$ .

Step 2. The percent of waves  $>20$  feet is  $(T^*/TH) \times 100\%$  or  $(181 \div 1236) \times 100\% = 14.6\%$ . Step 3. The answer is  $64.0\% \times 14.6\% = 9.4\%$

NOTE: If the answer was required for a month not included in the SOWM duration or interval tables, an approximate procedure would be to calculate the answer for the nearest two months, and then interpolate to the month desired.

3. Question: Considering all the intervals between events with significant

of >20 foot waves that  
 >24 hours is 100% so we  
 pute whichever is easier  
 subtract from 100% if  
 ry. Percentages are used  
 of the difference between  
 caused by missing data.  
 Compute the percent of  
 waves that lasted >24  
 In this example it will  
 ar to find the percent for  
 rs then subtract from 100%  
 in the percent we require.  
 requires the calculation of  
 tal number of hindcasts  
 this criterion.

wave heights greater than or  
 equal to 9 feet during a specific  
 month, what percentage persisted  
 more than 24 hours?

Sample Application: A tug has just arrived  
 at the location of a salvage  
 operation. Seas are less than 9  
 ft. In order to successfully  
 conduct the salvage operation,  
 the significant wave height must  
 remain less than 9 ft for at  
 least 24 hours. What is the  
 climatological probability that  
 the operation can successfully be  
 conducted?

cedure is as follows:

Frequency (From Table)		Hindcasts ≥20 ft Lasting ≤24 Hours
7	=	7
2	=	4
8	=	24
7	=	28
TOTAL:		63

ne percent of >20 foot  
 hat lasted <24 hours is  
 75) X 100% = 36.0%. The  
 of >20 foot waves lasted  
 urs is 100% - 36.0% =

The percent of waves >20  
 (T\*/TH) X 100% or (181÷  
 100% = 14.6%. Step 3.  
 ver is 64.0% X 14.6% =

If the answer was required  
 month not included in the  
 ration or interval tables,  
 approximate procedure would be  
 ulate the answer for the  
 two months, and then  
 late to the month desired.

ring all the intervals  
 events with significant

Answer: This problem involves the use of  
 the monthly interval tables,  
 since we want intervals between  
 wave height >9 ft. The number of  
 intervals between events of waves  
 >9 ft is 72 (from the TI column  
 of the interval table). The  
 number of intervals between  
 events (episodes) of wave height  
 >9 ft lasting 24 hours or less is  
 12 + 13 + 5 + 8 = 38. The  
 percentage of intervals between  
 waves >9 ft lasting 24 hours or  
 less is thus (38 ÷ 72) X 100% =  
 52.8%. In other words, 52.8% of  
 all the episodes with waves <9  
 ft persisted 24 hours or less,  
 and the percentage of <9 ft wave  
 episodes lasting longer than 24  
 hours is 100% - 52.8% = 47.2%.  
 Thus, the climatological  
 probability that the operation  
 can successfully be conducted is  
 47.2%.

4. Question: What percentage of the time can  
 significant wave heights less  
 than 12 ft be expected to  
 persist longer than two days?

Sample Application: A particular location  
 is being considered as an ASW  
 exercise area. Significant wave  
 heights less than 12 ft are

required for the exercises, which normally last at least two days. On an annual basis, what percentage of the time could exercises be successfully conducted at the location?

Answer: This problem requires the use of hindcast frequencies from the interval table which summarizes all months. We proceed following the steps outlined in Question 2. Step 1. Compute the percent of <12 ft waves that lasted >2 days. This requires estimation of the total number of hindcasts meeting this criterion. Estimation is necessary because beyond one day, the 0.25 day resolution of the hindcasts is lost in the summary process, so we must approximate the average number of hindcasts per interval. Since the 1 to 2 day interval includes episodes consisting of 1.25, 1.5, 1.75 and 2 days (that is 5, 6, 7, and 8 hindcasts), the average hindcasts per interval is 6.5. In this example it will be

easier and more accurate to find the percent for <2 days then subtract from 100 to obtain the percent we require. The procedure is as follows:

Interval	Hindcasts per Interval	Frequency (From Table)	Hindcasts Not ≥12 Ft Lasting ≤2 Days
0.25 day	1	X 53	= 53
0.50 day	2	X 34	= 68
0.75 day	3	X 25	= 75
1 day	4	X 15	= 60
1-2 days	6.5	X 52	= <u>338</u>
TOTAL:			594

Thus, the percent of <12 foot waves that lasted ≤2 days is  $(594 \div 9056) \times 100\% = 6.6\%$ . The percent of <12 foot waves that lasted >2 days is  $100\% - 6.6\% = 93.4\%$ . Step 2. The percent of waves <12 ft is  $(T^*/TH) \times 100\%$  or  $(10761 \div 13606) \times 100\% = 79.1\%$ . Step 3. The answer is  $93.4\% \times 79.1\% = 73.9\%$ .

# APPENDIX F

## COMPARISON OF SOWM WITH OTHER CLIMATOLOGIES

In this section; three other sources of wind and wave data that already have been summarized are compared to the SOWM hindcast data (hereafter referred to as SOWM) namely: (1) U. S. Navy Marine Climatic Atlas of the World, Volume I, North Atlantic Ocean (1974) (hereafter referred to as SHIP) (2) U. S. Army Atlantic Coast Hindcast, Deep Water, Significant Wave Information (1981) (hereafter referred to as ARMY; and (3) Climatic Summaries for NOAA Data Buoys (1983) (hereafter referred to as BUOY). Detailed information regarding the compilation of each of these three climatic atlases is contained within each atlas, but for the convenience of the reader a brief summary of each of the data sources follow.

The SHIP atlas contains climatic summaries of wind and wave data derived from archived observations of transient ships and Ocean Weather Stations (OWS) across the North Atlantic Ocean. The summaries are based on data dating back to the nineteenth century, but the overwhelming majority of the data comes from the 1950s and 1960s, and early 1970s. The wind speed from transient ships is often estimated rather than measured, while the OWS winds are measured. Quayle (1974, 1980) has shown that the long-term climatologies from measured winds (particularly at high wind speeds) at OWS are in fair agreement with estimated winds from transient ship observations. Cardone (1969) summarizes previous investigations of bias in winds reported by ships using the following formula (in knots):

$$U_c = 2.16 U_o^{7/9} \quad (F1)$$

Where  $U_c$  is the corrected wind speed and  $U_o$  is the observed wind speed from a single observation. The results of Quayle (1980) and Cardone (1969) are not necessarily in disagreement since the results of Quayle's study refer to climatological means and Cardone's study to individual ship observations. On the

other hand, it has been generally recognized that wave data climatologies based upon visual ship observations reflect heights that are too low. Quayle and Changery (1982) provide several reasons for this discrepancy.

1. Until July 1963, only the higher wave train was digitized from the ship report. Therefore, to mix pre-July 1963 data with late data in a consistent fashion, one could use only the higher of sea and swell. This, indeed, is the recommended procedure by the World Meteorological Organization (1960). By using only the higher of sea and swell, the significant wave height  $H$  (average height of the highest one-third of all waves present) is underestimated; a better estimate being:

$$H_s = (H^2_{\text{sea}} + H^2_{\text{swell}})^{1/2} \quad (F2)$$

according to Darbyshire and Draper (1963) further elaborated by Jardine (1979), and Jardine and Lathan (1981).

2. A fair-weather bias toward lower wave is sometimes suspected, as ships may try to avoid bad weather (Quayle, 1974). However, since ships often must slow down in storms, more data will be reported, thus possibly counteracting the fair-weather bias. Further, winds appear to be relatively more accurate than waves (Quayle, 1980), a situation that complicates simple "fair-weather bias" hypotheses.

3. The height of the bridge on a typical ship may be some tens of meters above the sea surface, thus making waves appear smaller than they actually are.

Wave heights in the ARMY have been summarized for 13 points off the east coast of North America. Like the SOWM these data were also derived from a discrete spectral model (Resio, 1981). However, for fetch-limited and duration-limited waves in their early stages of development, Dexter (1974), and Resio and Vincent (1979) indicate that a model such as used in the ARMY may result in significant differences from other discrete spectral models. For example, the SOWM does not use parameterized

it has been generally recognized that climatologies based upon visual observations reflect heights that are too low and Changery (1982) provide several examples of this discrepancy.

Until July 1963, only the higher wave heights were digitized from the ship report. To mix pre-July 1963 data with later data in a consistent fashion, one could use only the higher of sea and swell. This, indeed, is the recommended procedure by the World Meteorological Organization (1960). By using the higher of sea and swell, the wave height  $H$  (average height of the one-third of all waves present) is underestimated; a better estimate being:

$$(H^2_{\text{sea}} + H^2_{\text{swell}})^{1/2} \quad (F2)$$

as reported by Darbyshire and Draper (1963), elaborated by Jardine (1979), and Lathan (1981).

The fair-weather bias toward lower waves is suspected, as ships may try to avoid rough weather (Quayle, 1974). However, ships often must slow down in storms, more wave heights may be reported, thus possibly reducing the fair-weather bias. Further, ships are more likely to be relatively more accurate than in fair weather (Quayle, 1980), a situation that may be described as a "fair-weather bias".

The height of the bridge on a typical ship is some tens of meters above the sea surface. Thus making waves appear smaller than they really are.

Wave heights in the ARMY have been measured for 13 points off the east coast of North America. Like the SOWM these data were derived from a discrete spectral model (see Appendix 1). However, for fetch-limited and swell-limited waves in their early stages of development, Dexter (1974), and Resio and Vrolop (1979) indicate that a model such as the ARMY may result in significant differences from other discrete spectral models. Also, the SOWM does not use parameterized

nonlinear wave growth theory, but the ARMY model does contain such parameterization. The ARMY model was run for the same 20-year period as the SOWM. In fact, the input wind fields were generated from the same reconstructed sea-level pressure fields used in the SOWM. However, based upon comparisons of the pressure fields used by the SOWM and the National Weather Service's (NWS) sea-level pressure field, the U.S. Army Hydraulics Laboratory (1980, 1982) concluded that the pressure field used by the SOWM was incompatible with pressure measurements near storm systems off the east coast of North America. This may be due to a combination of the blending procedure used to produce pressure gradients and the relatively large grid spacing (approximately 200 nautical miles at 50°N) used to capture the central pressure of extratropical storms. For this reason the SOWM sea-level pressure fields were supplemented with NWS data. For storms within a specified area near the U.S. Atlantic coast, the pressure field was represented by NWS data, and for storms outside this area, NWS data were blended with the SOWM sea-level pressure fields. Based on this reconstructed sea-level pressure field, a frictionless quasi-geostrophic wind speed is estimated and reduced to a level of 64 feet after consideration of thermal stability.

Climatic summaries for the BUOY are derived from NOAA data buoys 41001 (34.7N, 72.3W) and 42001 (26.0N, 90.0W). They provide one of the few sources of measured wave data. Unfortunately, the period of record (1976-1982) and the number of these buoys are limited. The two buoys available for comparison with the Navy are located off the east coast of North America and in the Gulf of Mexico and contain about 10,000 hourly or three-hourly observations. Both wind and wave summaries are contained in the BUOY atlas. The data for the two buoys were acquired from a 12-m disc hull, but after May 1977 buoy 42001 used a boat shaped hull 6m by 3m. The meteorological sensors were located 5m to 10m above the water. Part of each buoy payload included a strapped down accelerometer and an electronic double integration system. A digital filter called the "Wave Spectrum Analyzer" (WSA) was used to process the output through most of 1979. Due to a noisy signal the

quality of these data were not as good as had been desired, and contain numerous periods of missing data, but have been deemed acceptable to most users of the data (NOAA Data Buoy Office, 1982). Higher quality data were available after 1978 by using a more advanced payload system and a refined spectral system, the "Wave Data Analyzer" (WDA).

Comparisons of the wave period between the various atlases have purposely been avoided. Users should be cautioned that the wave periods summarized in the ARMY and the SHIP atlases are associated with the higher of the two wave components, the sea or the swell. In the BUOY atlas, the wave period summarized refers to the average wave period. In this atlas the wave period, as described in Appendix C, is the period associated with the largest variance density in the variance spectrum.

Wave height and wind speed cumulative relative frequencies for various class intervals can be derived from the wind and wave summaries from each atlas (except the ARMY where wind information has not been summarized). The upper limits of the class intervals contained in each atlas are listed in Table F1. Using the

cumulative relative frequency statistics and class limits in Table F1, ogives were developed for nearby areas from each data source seasonally, monthly, and annually (dependent upon the averaging period of the initial summaries). The class intervals lacking upper bounds were not used. The actual values of wind speed and wave height from the 5th, 20th, 50th, 80th, and 95th (and occasionally other percentiles were derived from each ogive. In some instances the lower percentiles could not be used because too many observations fell in the first class interval. These values were then compared for nearby locations. It should be noted that for each comparison, significant gradients between the locations of interest were avoided. This was determined by checking either 1° or 2° squares of summaries of summaries of observations for wave heights and wind speeds.

For the wind speed comparisons, the buoy data were adjusted to a level of 20m. Stabilized estimates were made by using monthly averages of air-sea temperature differences. Adjustments were made using the equations recommended by the World Meteorological Organization (Dobson, 1981). No height corrections were applied to data obtained from the SHIP atlas. The average anemometer height for merchant ships is already close to 20m, and a height correction could introduce unpredictable errors as a result of flow distortion around a ship (Dobson, 1981).

TABLE F1

UPPER LIMITS OF CLASS INTERVALS USED FROM VARIOUS WIND AND WAVE CLIMATOLOGIES

WIND SPEED (kn)				WAVE HEIGHT (ft)			
SOWM	ARMY	SHIP	BUOY	SOWM	ARMY	SHIP	BUOY
1.5	N	3.5	3.5	3	1.6, 3.3	2.5	4.1
6	O	6.5	6.5	6	4.9, 6.6	5.7	7.4
11.5	T	10.5	10.5	9	8.2, 9.8	9.0	10.7
16.5		16.5	16.5	12	11.5, 13.1	12.3	13.9
21.5	A	21.5	21.5	16	14.8, 16.4	18.9	17.2
27.5	V	27.5	27.5	20	18.0, 19.7	25.4	20.5
33.5	A	33.5	33.5	24	21.3, 23.0	32.0	23.8
40.5	I	40.5	40.5	28	24.6, 26.2		27.1
47.5	L	47.5	47.5	34	27.9, 29.5		30.3
63.5	A			40	31.2, 32.8		33.6
	B			48	34.4, 36.1		
	L			56	37.7, 39.4		
	E			64	42.6, 44.3		
					45.9, 47.6		
					49.2		

The results of the SOWM and SHIP comparisons of wind speed and wave height for seven areas in the North Atlantic Ocean are shown in Figs. F1 through F8, respectively. From Figs. F1 through F4 it is immediately apparent that the SOWM winds are often lower than the winds as presented in the SHIP atlas. This discrepancy is most striking in the western North Atlantic Ocean and in the Gulf of Mexico. The differences generally diminish and sometimes change sign in (Figs. F1 through F4) moving from southwest to northeast. It would be difficult to rationalize systematic spatial errors in the winds obtained from the SHIP atlas. Undoubtedly, some of the differences can be attributed to the underestimation of the intensity of extratropical storms by the SOWM due to the inadequate definition of the central



ve relative frequency statistics and the  
 its in Table F1, ogives were developed  
 by areas from each data source  
 ly, monthly, and annually (depending  
 averaging period of the initial data  
 ). The class intervals lacking upper  
 ere not used. The actual values of the  
 ed and wave height from the 5th, 20th,  
 th, and 95th (and occasionally other)  
 les were derived from each ogive. In  
 tances the lower percentiles could not  
 because too many observations fell into  
 t class interval. These values were  
 pared for nearby locations. It should  
 that for each comparison, significant  
 s between the locations of interest were  
 This was determined by checking either  
 20 squares of summaries of ship  
 tions for wave heights and wind speeds.

r the wind speed comparisons, the buoy  
 re adjusted to a level of 20m. Stability  
 es were made by using monthly averages of  
 temperature differences. Adjustments  
 de using the equations recommended by the  
 eteorological Organization (Dobson, 1981).  
 ight corrections were applied to data  
 d from the SHIP atlas. The average  
 ter height for merchant ships is already  
 o 20m, and a height correction could  
 ice unpredictable errors as a result of  
 stortion around a ship (Dobson, 1981).

he results of the SOWM and SHIP  
 ons of wind speed and wave height for  
 areas in the North Atlantic Ocean are  
 in Figs. F1 through F8, respectively.  
 gs. F1 through F4 it is immediately  
 at that the SOWM winds are often lower  
 he winds as presented in the SHIP atlas.  
 iscrepancy is most striking in the western  
 Atlantic Ocean and in the Gulf of Mexico.  
 ifferences generally diminish and sometimes  
 sign in (Figs. F1 through F4) moving from  
 est to northeast. It would be difficult  
 ionalize systematic spatial errors in the  
 obtained from the SHIP atlas.  
 tedly, some of the differences can be  
 uted to the underestimation of the  
 ity of extratropical storms by the SOWM,  
 the inadequate definition of the central

pressures of these storms by the SOWM sea-level  
 pressure field. This would be most applicable  
 to storms of rapid development and fast movement  
 (U.S. Navy, 1975), as commonly occur off the  
 east coast of North America. The consistently  
 weaker winds of the SOWM in the Gulf of Mexico  
 is noteworthy, particularly since the  
 differences become less during the stormier  
 times of the year.

The SOWM wave heights are shown to be  
 significantly higher for the three or four more  
 northerly areas of comparison (Figs. F5 through  
 F8), particularly during the winter when the  
 wave heights are high. They depict the bias  
 toward lower wave heights in the SHIP atlas,  
 sometimes even when the wind field in the SOWM  
 is less than that observed by ship observations.  
 Pierson (1982) states that despite lower winds,  
 the SOWM often gives higher waves compared to  
 visual estimates. This is attributed to the  
 processing and observational biases in the SHIP  
 atlas. In the areas located further south and  
 east, wave heights are equal to or lower than  
 those in the SHIP atlas, especially during the  
 summer months. The general characteristics of  
 the wave height comparisons more or less  
 substantiate the underestimation of the wind  
 field near the U.S. east coast by the SOWM.  
 Pierson (1982) also indicates that the errors in  
 the SOWM's wave heights are strongly dependent  
 upon wind speed specification errors. Assuming  
 a simple relation between a fully developed wave  
 spectrum (sea) to the local wind speed (a gross  
 simplification), Pierson (1982) shows that

$$\bar{H}_{1/3} = 1.82 \times 10^{-2} u^2 \quad (F3)$$

where  $\bar{H}_{1/3}$  is in feet and  $u^2$  is the wind speed  
 in knots. As an example, Table F2 depicts the  
 differences in wave height for the month of  
 November that would be expected if the wind  
 speed as summarized in the SHIP atlas for the  
 location 44N, 41W (Ocean Weather Ship E) were  
 used in Eq. F3 as opposed to the speeds from the  
 SOWM grid point at 44.1N, 42.1W. From Table F2  
 and Figs. F5-F8 it can be seen that the SOWM  
 atlas wave height climatology should be an  
 overall improvement over the SHIP atlas wave  
 climatology (especially in the areas and times

(2)

TABLE F2

THE EFFECT OF DIFFERENT WIND SPEED ESTIMATES ON THE SIGNIFICANT

WIND SPEED (kn)				WAVE HEIGHT	
SOWM 44.1 N 42.1 W	SHIP 44 N 41 W	SOWM SHIP	DIFFERENCE SOWM-SHIP	SOWM 44.1 N 42.1 W	SHIP 44 N 41 W
5.0	7.0	0.7	-2.0	0.5	0.9
9.8	12.5	0.8	-2.7	1.7	2.8
16.4	20.2	0.8	-3.8	4.9	7.4
24.7	29.0	0.9	-4.3	11.1	15.3
32.3	38.0	0.9	-5.7	18.9	26.3

of the year when high seas are common). However, in cases where the SOWM input winds are significantly low, the resulting wave heights may not be as high as they should be. This could occur even when the wave heights produced were comparable to those reported in the SHIP atlas, because in these instances the wave heights reported in both the SHIP and SOWM atlases might in fact underestimate the actual wave height.

Since the ARMY did not contain wind summaries, comparisons with the SOWM are available for wave heights only (Figs. F9 through F12). It can be safely assumed, however, that the ARMY input wind field was generally stronger than the SOWM (U.S. Army Hydraulics Laboratory, 1980). The SOWM and ARMY wave heights are compared for the four seasons (winter, January through March; spring, April through June, etc.). Two ARMY points off Cape Hatteras are compared to the same SOWM grid point, since one point is just north and the other south of the SOWM point. Another comparison is made for two nearby points off

Florida's east coast. For all seasons and all comparisons the ARMY waves are higher than the SOWM waves. The SOWM waves are generally 10 to 20% lower than the ARMY wave heights during the spring and summer, and generally 10 to 30% lower during the fall and winter. Undoubtedly, a large portion of this difference can be attributed to the input wind fields generating the waves (see Appendix B).

Due to the limited observational period in the BUOY atlas, only the annual wave and wind summaries are compared to the SOWM atlas values (Figs. F13 and F14). The SOWM atlas wind speeds and wave heights are lower than those in the BUOY atlas for the comparative data off Cape Hatteras. In contrast, the SOWM wind speeds for the Gulf of Mexico grid point (Fig. F13) are close to those reported by the BUOY atlas while the wave heights are higher. Unfortunately, the period of record summarized for the BUOY atlas covers only recent years and does not match the SOWM period of record. This may have introduced some bias in these comparisons. For example, when an overlapping period of wind speed data

TABLE F2

ESTIMATES ON THE SIGNIFICANT WAVE HEIGHT

CE IP	WAVE HEIGHT (ft)			
	SOWM 44.1 N 42.1 W	SHIP 44 N 41 W	<u>SOWM</u> <u>SHIP</u>	DIFFERENCE SOWM-SHIP
	0.5	0.9	0.6	-0.4
	1.7	2.8	0.6	-1.1
	4.9	7.4	0.7	-2.5
	11.1	15.3	0.7	-4.2
	18.9	26.3	0.7	-7.4

For all seasons and all waves are higher than the waves are generally 10 to 15 wave heights during the winter. Undoubtedly, a difference can be at wind fields generating (x B).

and observational period in the annual wave and wind to the SOWM atlas values. The SOWM atlas wind speeds lower than those in the comparative data off Cape, the SOWM wind speeds for point (Fig. F13) are by the BUOY atlas while higher. Unfortunately, the rized for the BUOY atlas and does not match the. This may have introduced comparisons. For example, od of wind speed data

(August through December 1975) for the BUOY and SOWM grid point in the Gulf of Mexico were compared, the SOWM had stronger winds (2 to 4 knots) than those in the BUOY atlas. Nonetheless, if one assumes the BUOY climatology is representative, both sets of comparisons would suggest that the SOWM overestimates wave heights in Central Gulf of Mexico. But, if this is the case, the SHIP atlas overestimates the waves by an even greater magnitude ... a conclusion that has not been reached in any of several previous analyses of transient ship and ocean weather station data.

Table F3 presents a qualitative summary of the differences between SOWM data and the other data sources examined. In general off the southeast coast of the U.S., the wave heights reported in the SOWM atlas are less than the wave heights reported in the other atlases. In other areas where high seas are a typical climatic feature during the stormier seasons of the year, SOWM atlas wave heights are generally higher than SHIP atlas wave heights. The ARMY atlas and the BUOY atlas do not provide wave data for these areas.

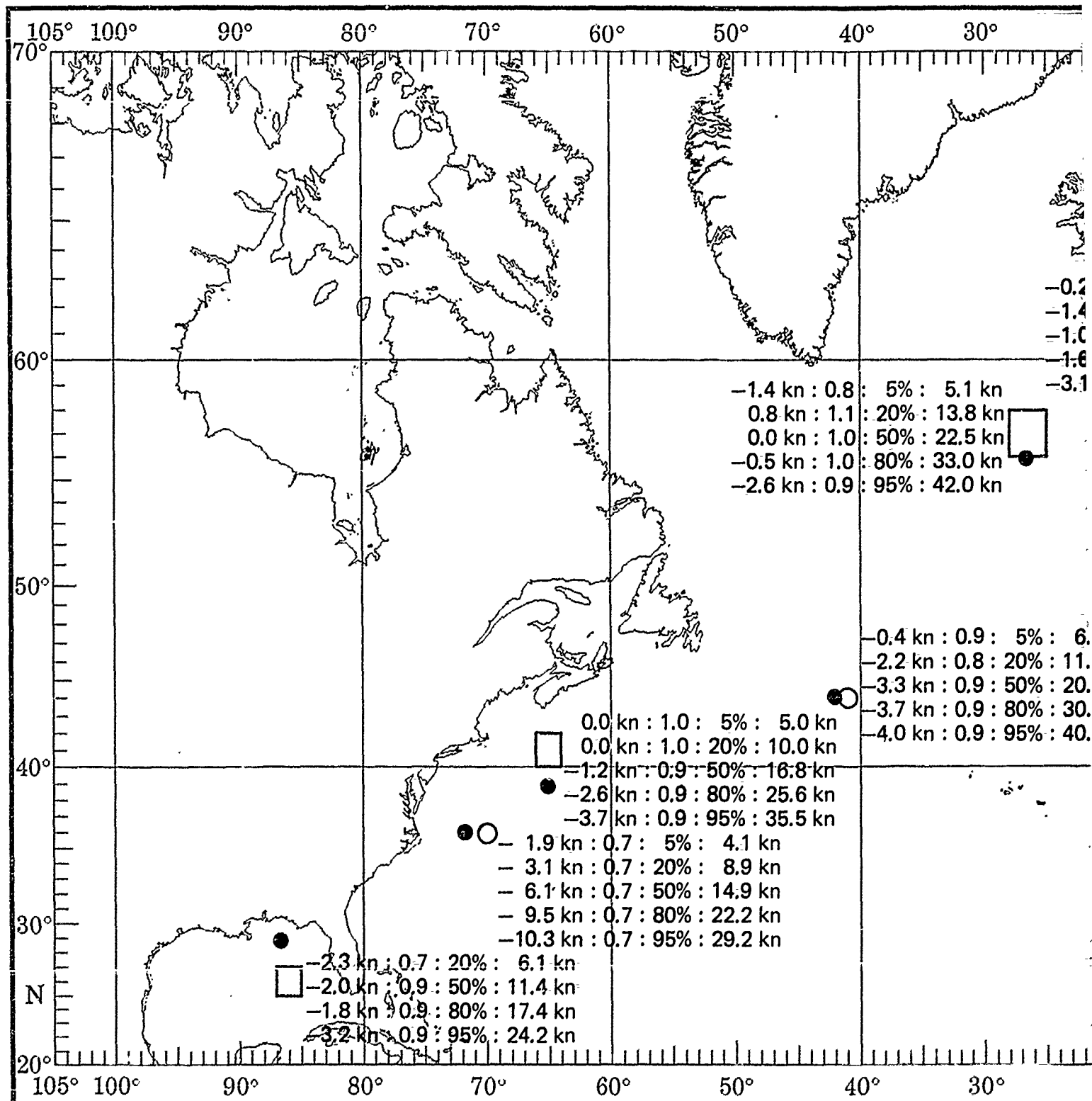
TABLE F3

QUALITATIVE SUMMARY OF DIFFERENCES BETWEEN DATA TYPES IN THE  
NORTH ATLANTIC OCEAN FOR SOWM, ARMY, BUOY, AND SHIP ATLASES

(H=HIGHEST, L=LOWEST, M=MIDDLE, X=UNKNOWN AT PRESENT)

AREAS	DATA SOURCE	TIME PERIOD									
		WINTER Jan-Mar		SPRING Apr-Jun		SUMMER Jul-Sep		AUTUMN Oct-Dec		ANNUAL	
		WINDS	WAVES	WINDS	WAVES	WINDS	WAVES	WINDS	WAVES	WINDS	WAVES
GULF OF MEXICO	SOWM	L	L	L	L	L	L	L	L	M	M
	SHIP	H	H	H	H	H	H	H	H	H	H
	BUOY	X	X	X	X	X	X	X	X	L	L
WESTERN ATLANTIC (NEAR EAST COAST OF U.S.)	SOWM	L	L	L	L	L	L	L	L	L	L
	SHIP	H	M	H	H	H	H	H	M	M	H
	BUOY	X	X	X	X	X	X	X	X	M	M
	ARMY	X	H	X	M	X	M	X	M	X	H
OPEN OCEAN (NON-TROPICAL)	SOWM	L	H	L	M	L	L	L	H	L	H
	SHIP	H	L	H	M	H	H	H	L	H	L
OPEN OCEAN (SOUTH OF 15° N)	SOWM	L	M	L	L	L	L	L	L	L	L
	SHIP	H	M	H	H	H	H	H	H	H	H
CARIBBEAN	SOWM	H	H	H	H	M	H	M	M	H	H
	SHIP	L	L	L	L	M	L	M	M	L	L
NORTH SEA	SOWM	M	M	H	H	M	L	H	M	H	H
	SHIP	M	M	L	L	M	H	L	M	L	L

FIG. F1 DIFFERENCE (SOWM-SHIP) AND RATIOS (SOWM/SHIP) OF SOWM AND S PERCENTILES AND THEIR ASSOCIATED WIND SPEEDS



# (SOWM/SHIP) OF SOWM AND SHIP WIND SPEEDS FOR SELECTED SOWM AND SPEEDS

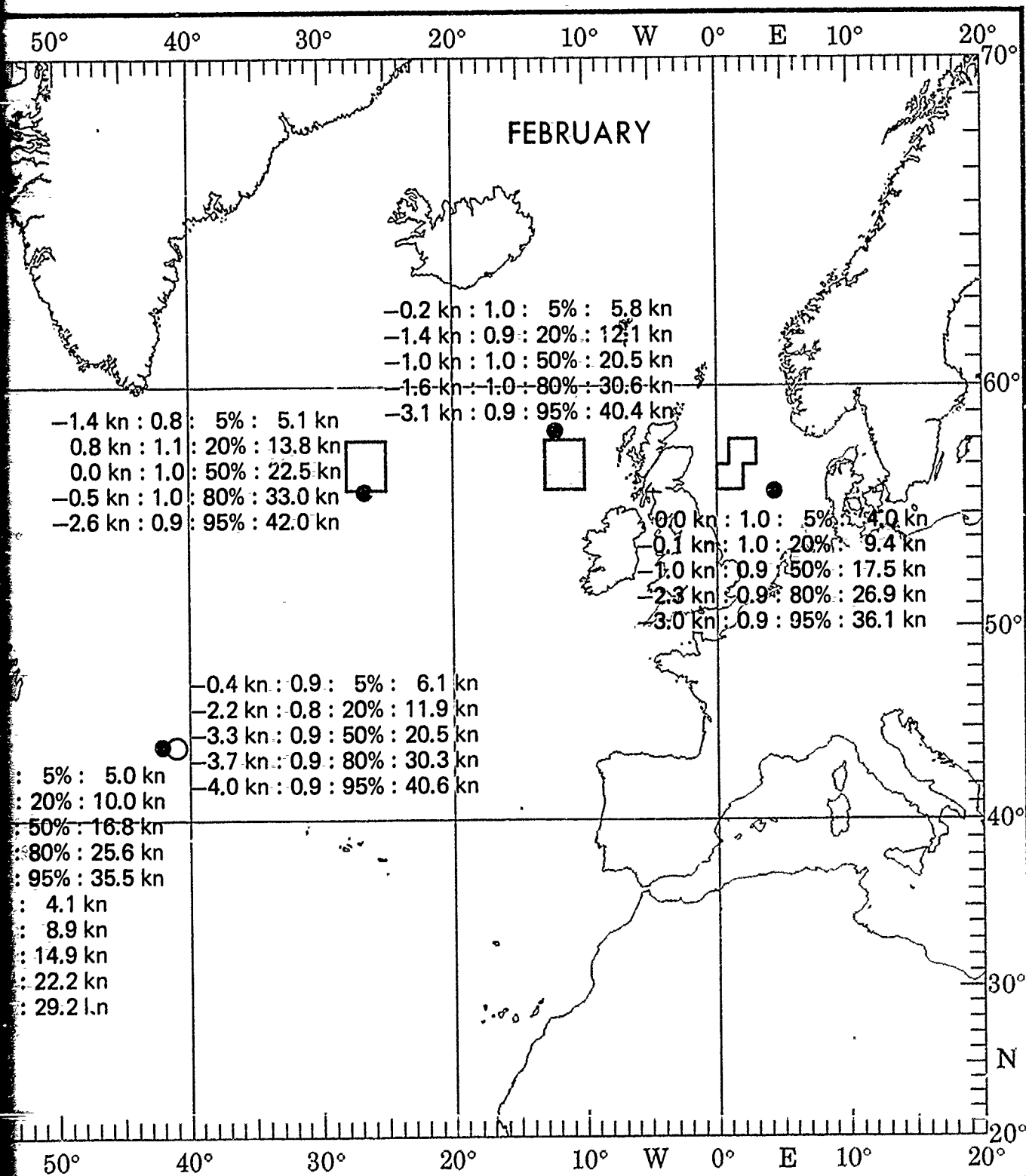
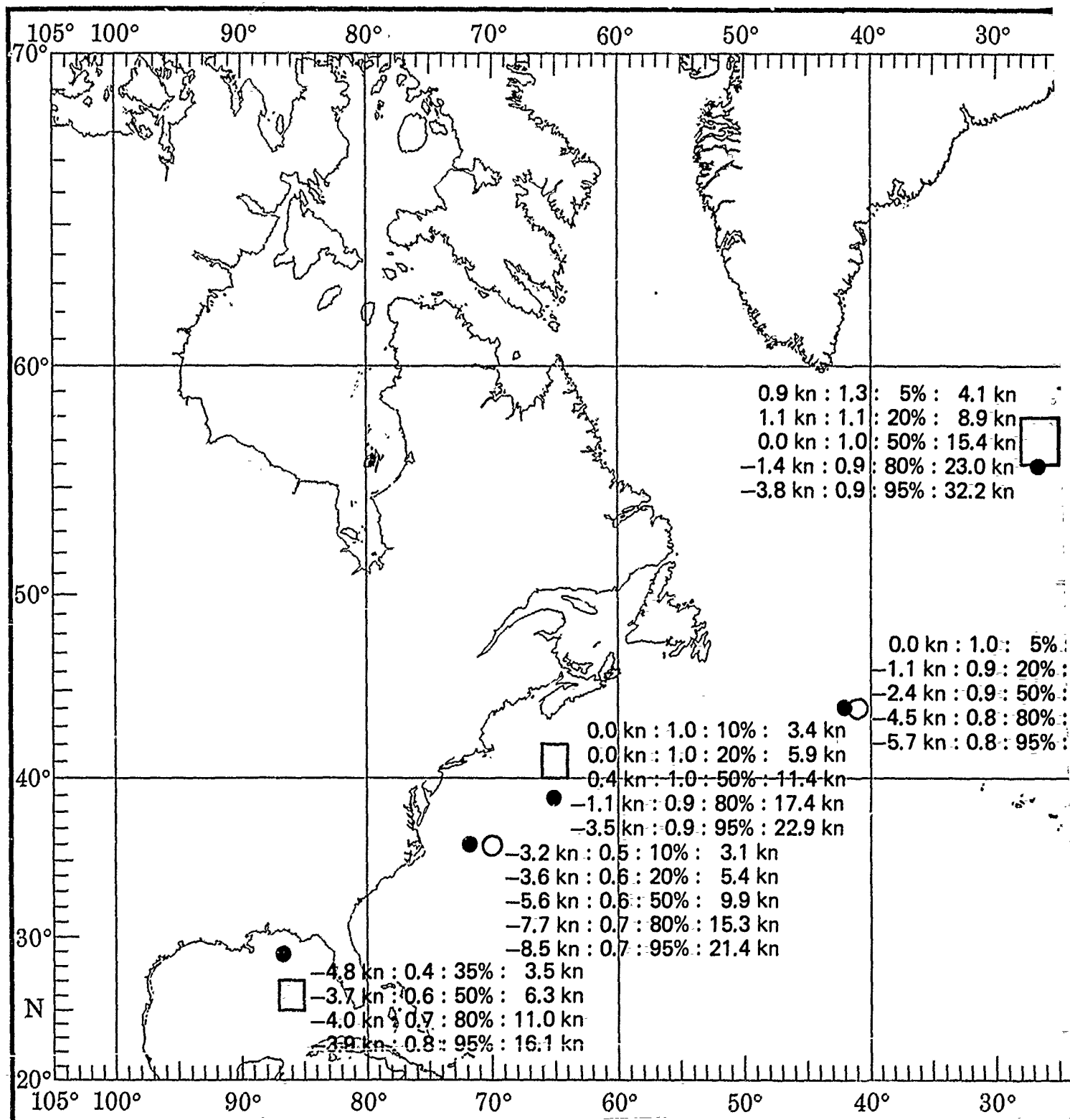




FIG. F2 DIFFERENCE (SOWM-SHIP) AND RATIOS (SOWM/SHIP) OF SOWM AND PERCENTILES AND THEIR ASSOCIATED WIND SPEEDS



# WM/SHIP) OF SOWM AND SHIP WIND SPEEDS FOR SELECTED SOWM D SPEEDS

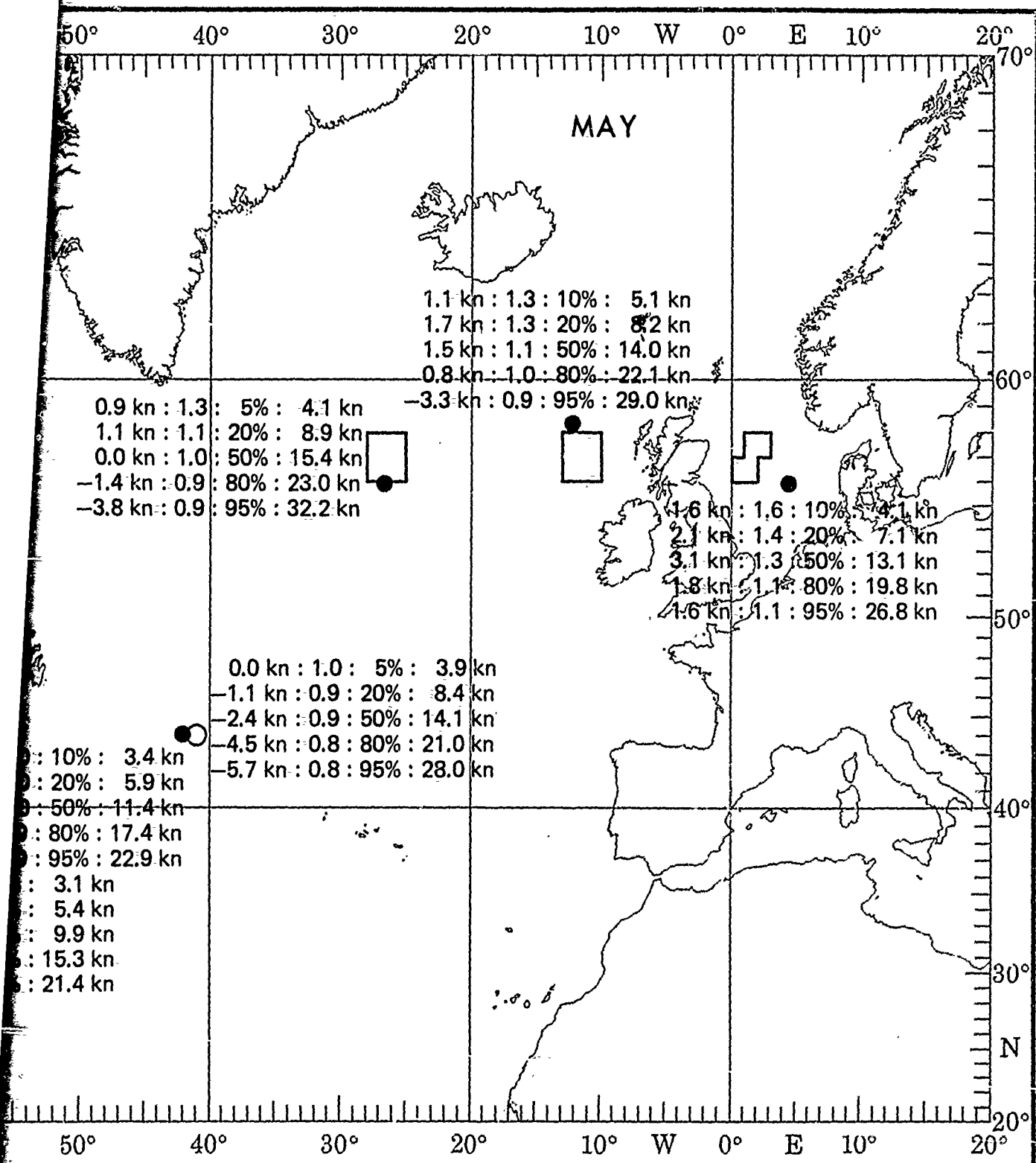
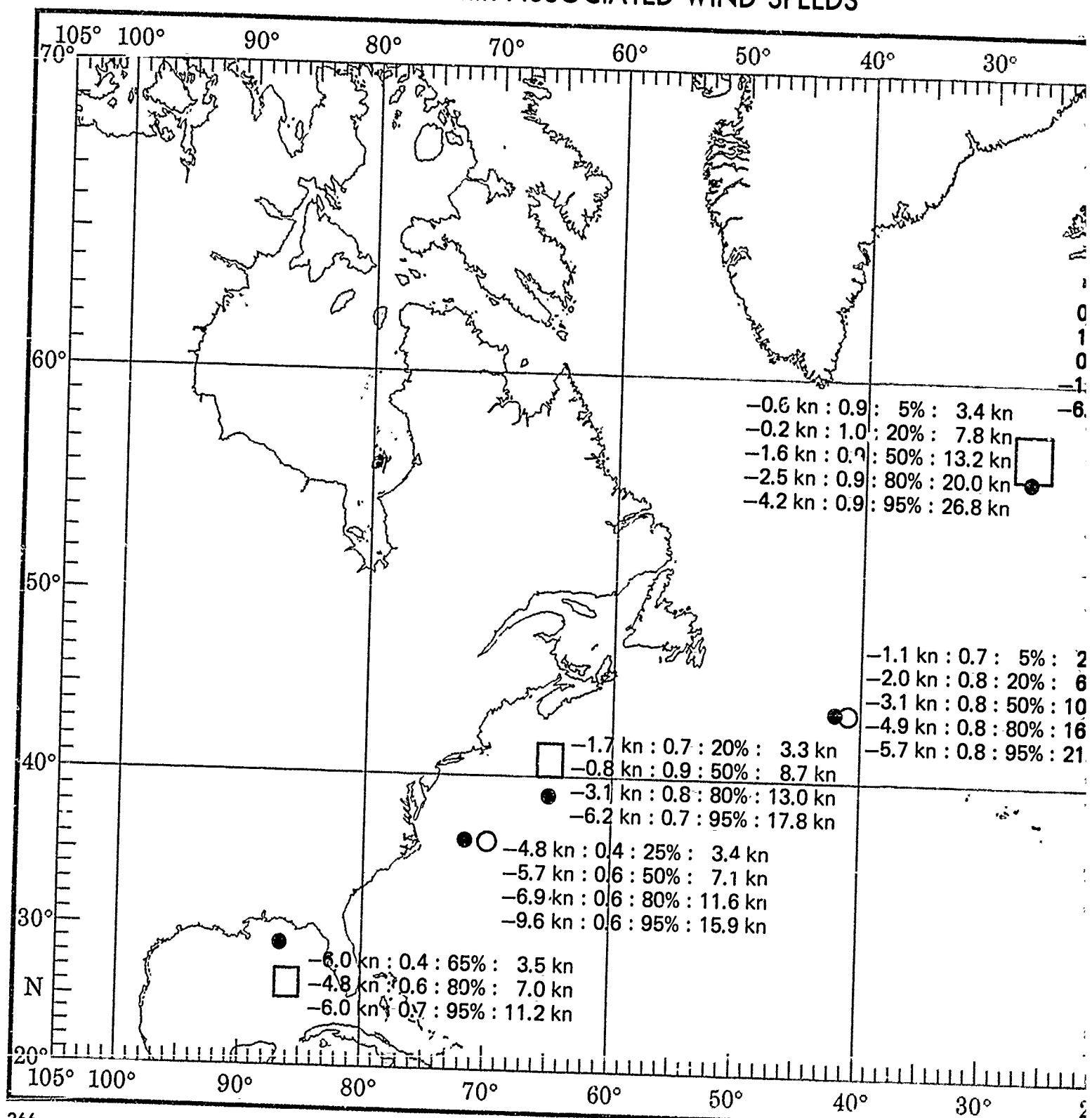


FIG. F3 DIFFERENCE (SOWM-SHIP) AND RATIOS (SOWM/SHIP) OF SOWM AND PERCENTILES AND THEIR ASSOCIATED WIND SPEEDS



# A/SHIP) OF SOWM AND SHIP WIND SPEEDS FOR SELECTED SOWM PEEDS

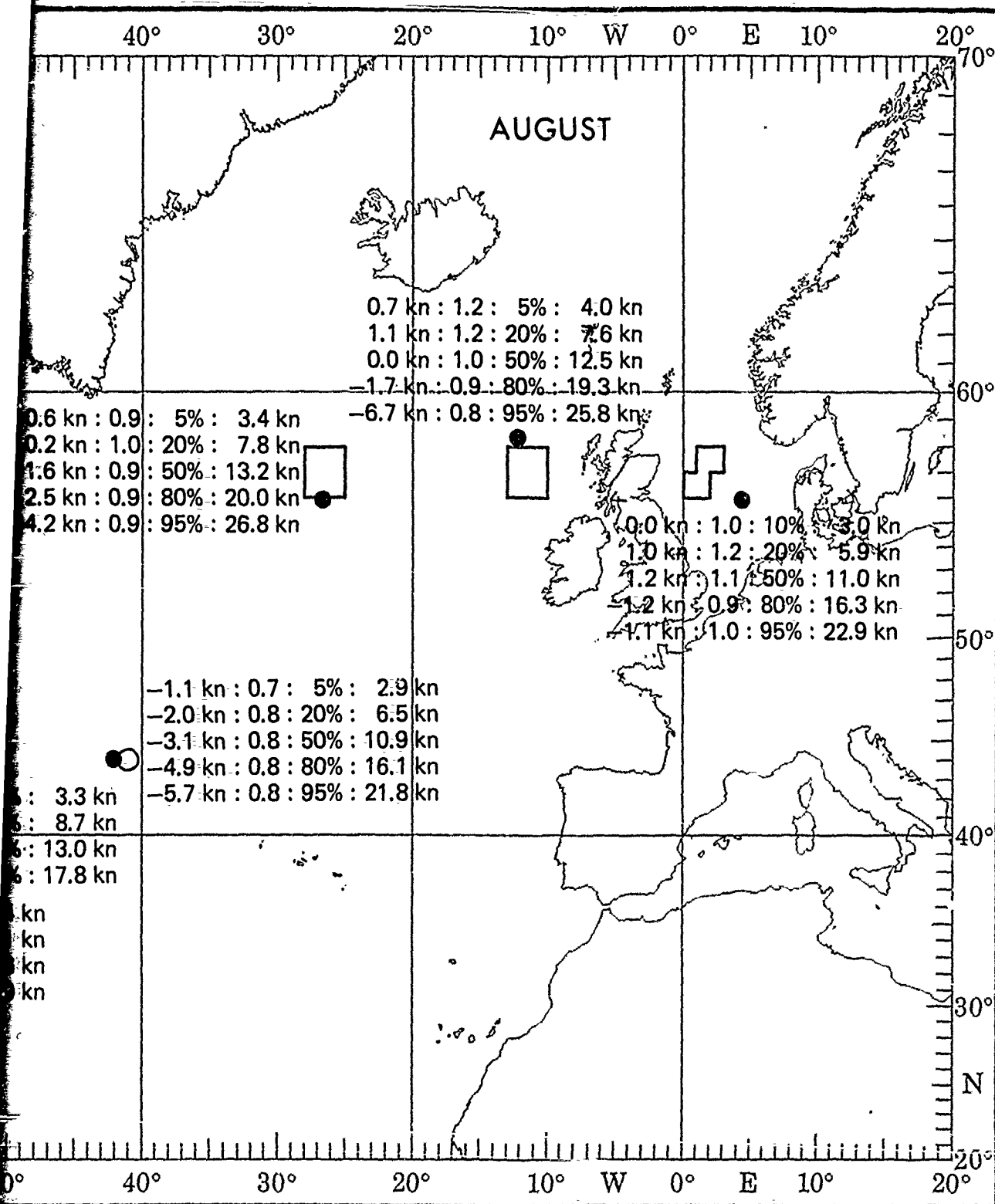
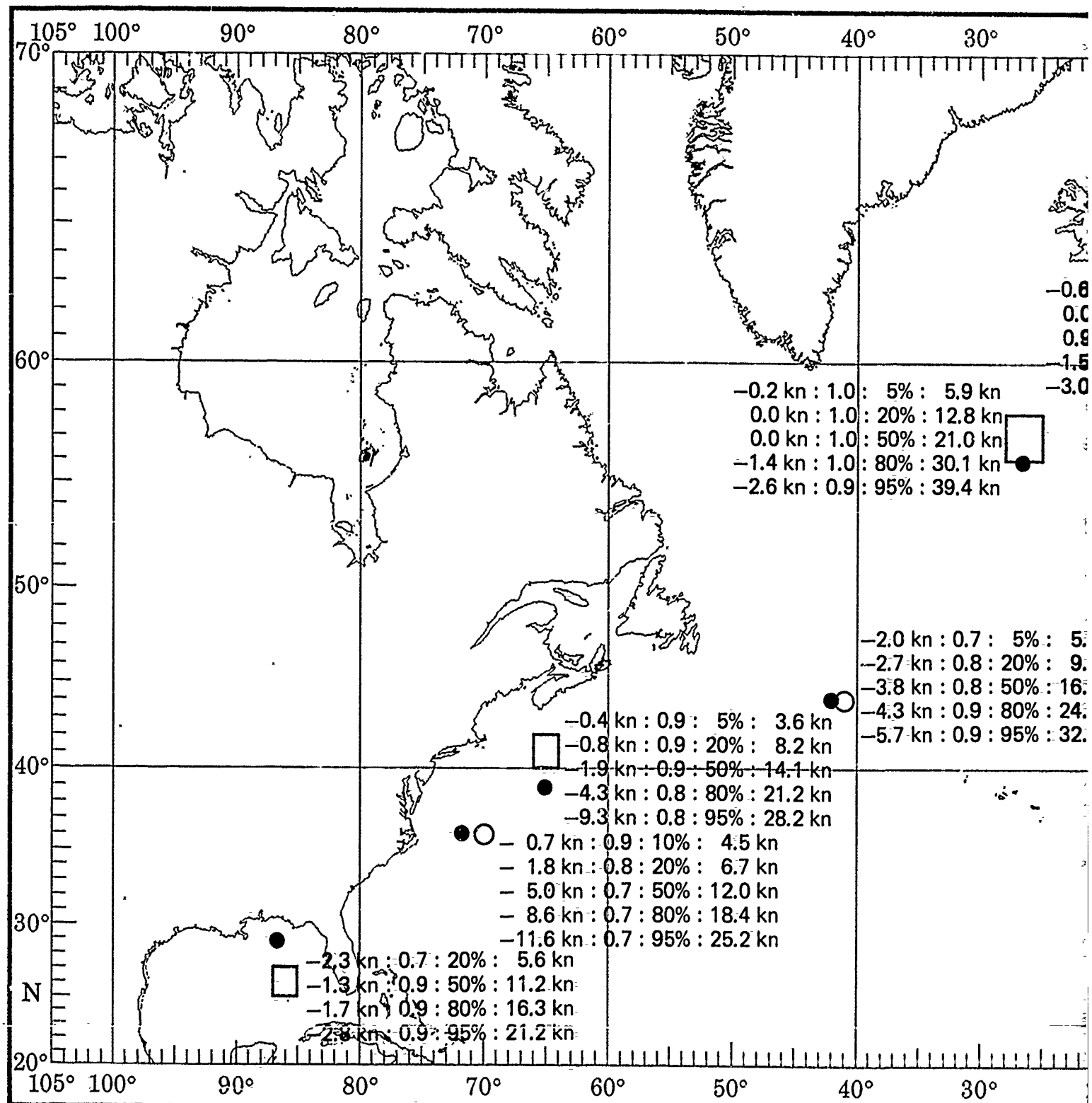


FIG. F4 DIFFERENCE (SOWM-SHIP) AND RATIOS (SOWM/SHIP) OF SOWM AND S PERCENTILES AND THEIR ASSOCIATED WIND SPEEDS



# S (SOWM/SHIP) OF SOWM AND SHIP WIND SPEEDS FOR SELECTED SOWM WIND SPEEDS

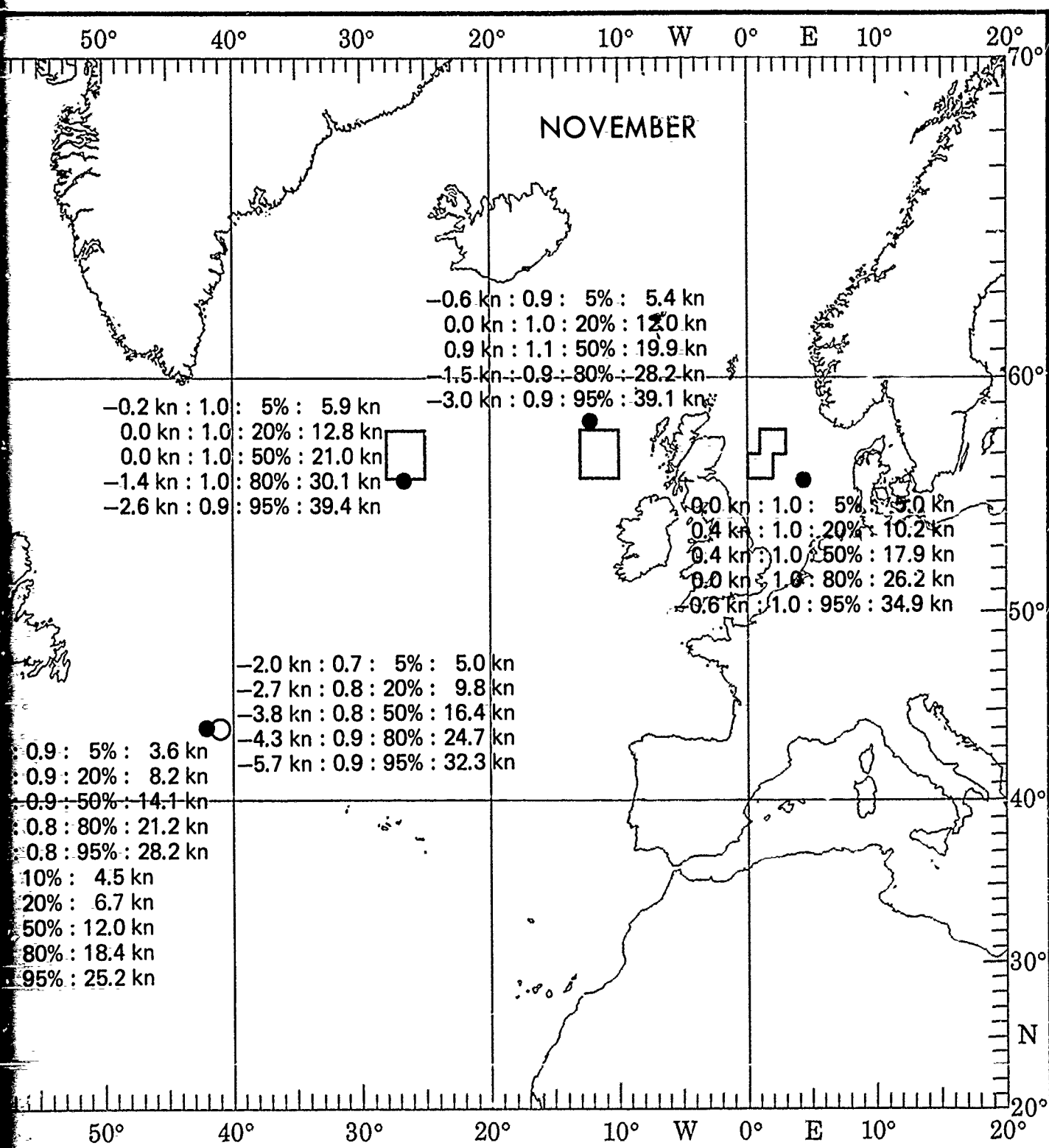
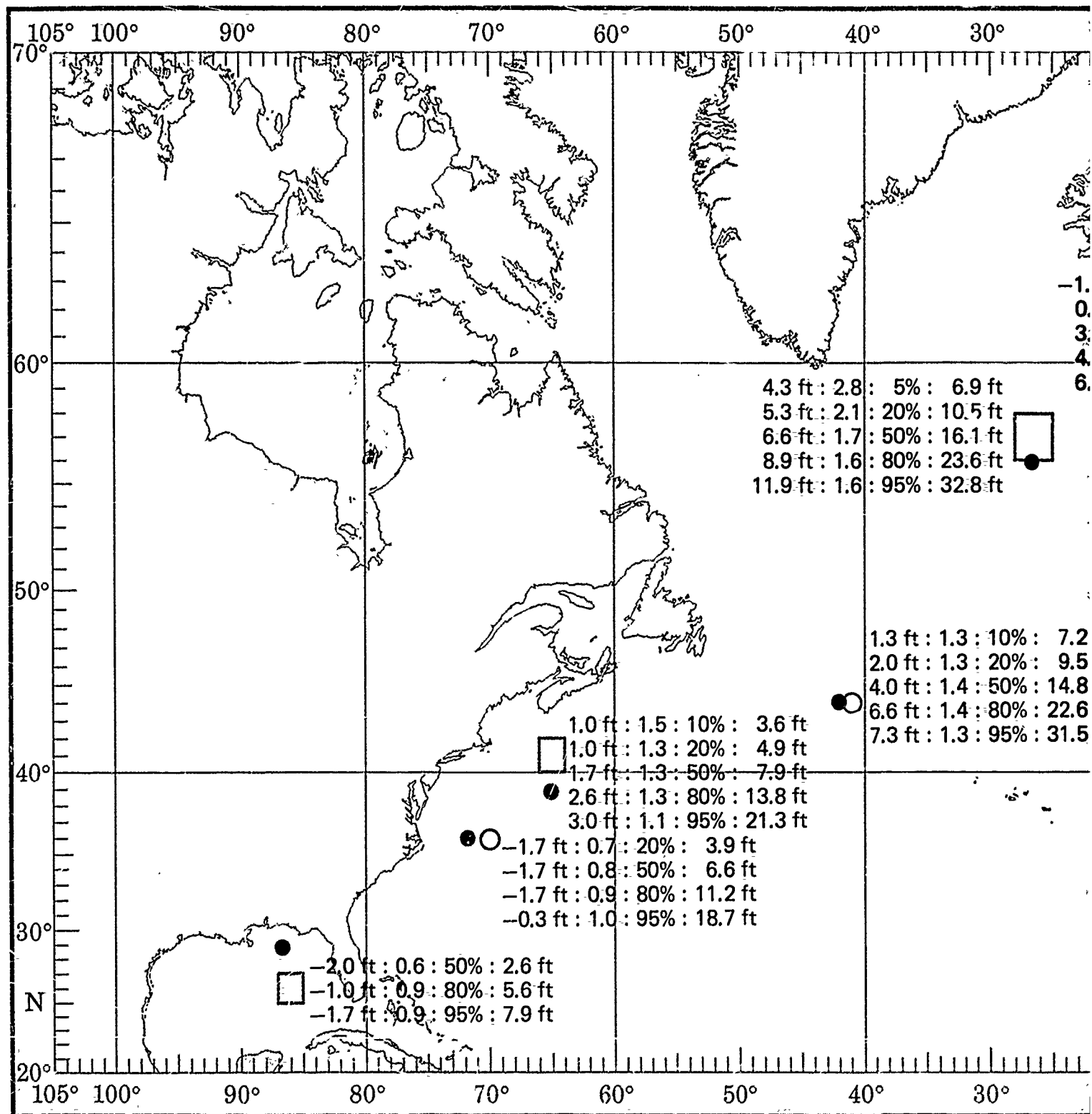
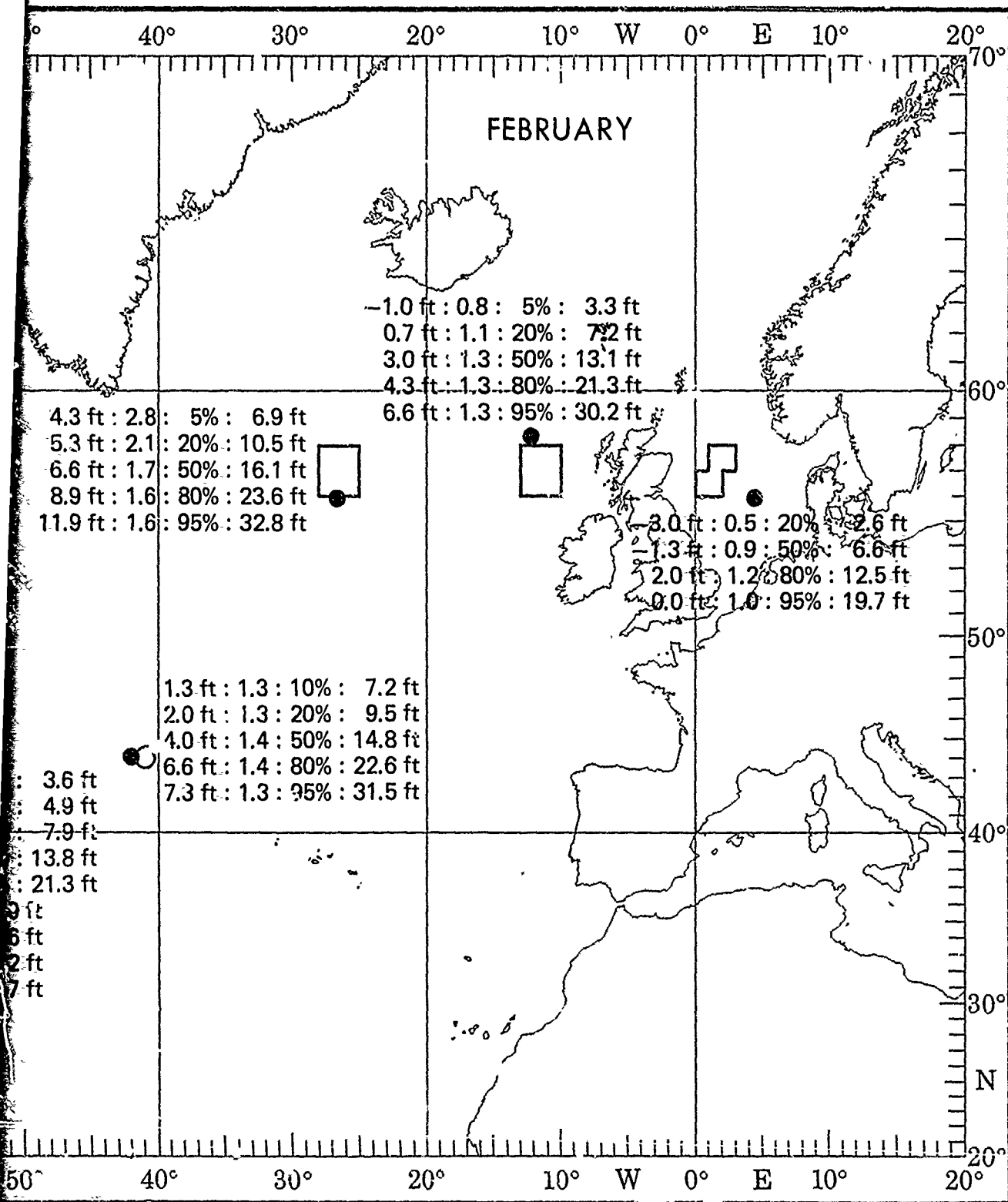




FIG. F5 DIFFERENCE (SOWM-SHIP) AND RATIOS (SOWM/SHIP) OF SOWM AND SHIP WAVE PERCENTILES AND THEIR ASSOCIATED WAVE HEIGHTS

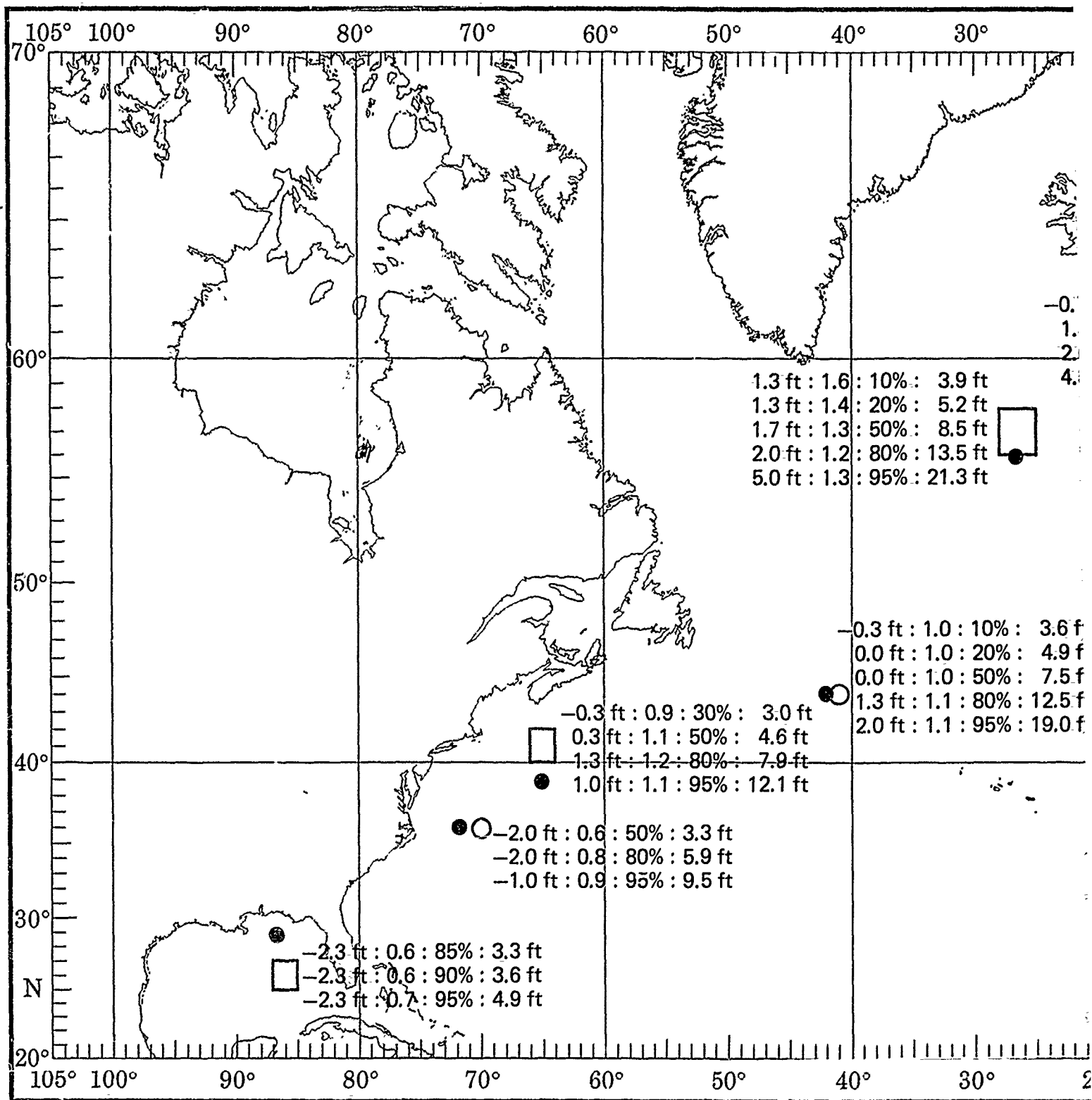


# (A/SHIP) OF SOWM AND SHIP WAVE HEIGHTS FOR SELECTED SOWM HEIGHTS



(2)

FIG. F6 DIFFERENCE (SOWM-SHIP) AND RATIOS (SOWM/SHIP) OF SOWM AND SH PERCENTILES AND THEIR ASSOCIATED WAVE HEIGHTS



# DS (SOWM/SHIP) OF SOWM AND SHIP WAVE HEIGHTS FOR SELECTED SOWM D WAVE HEIGHTS

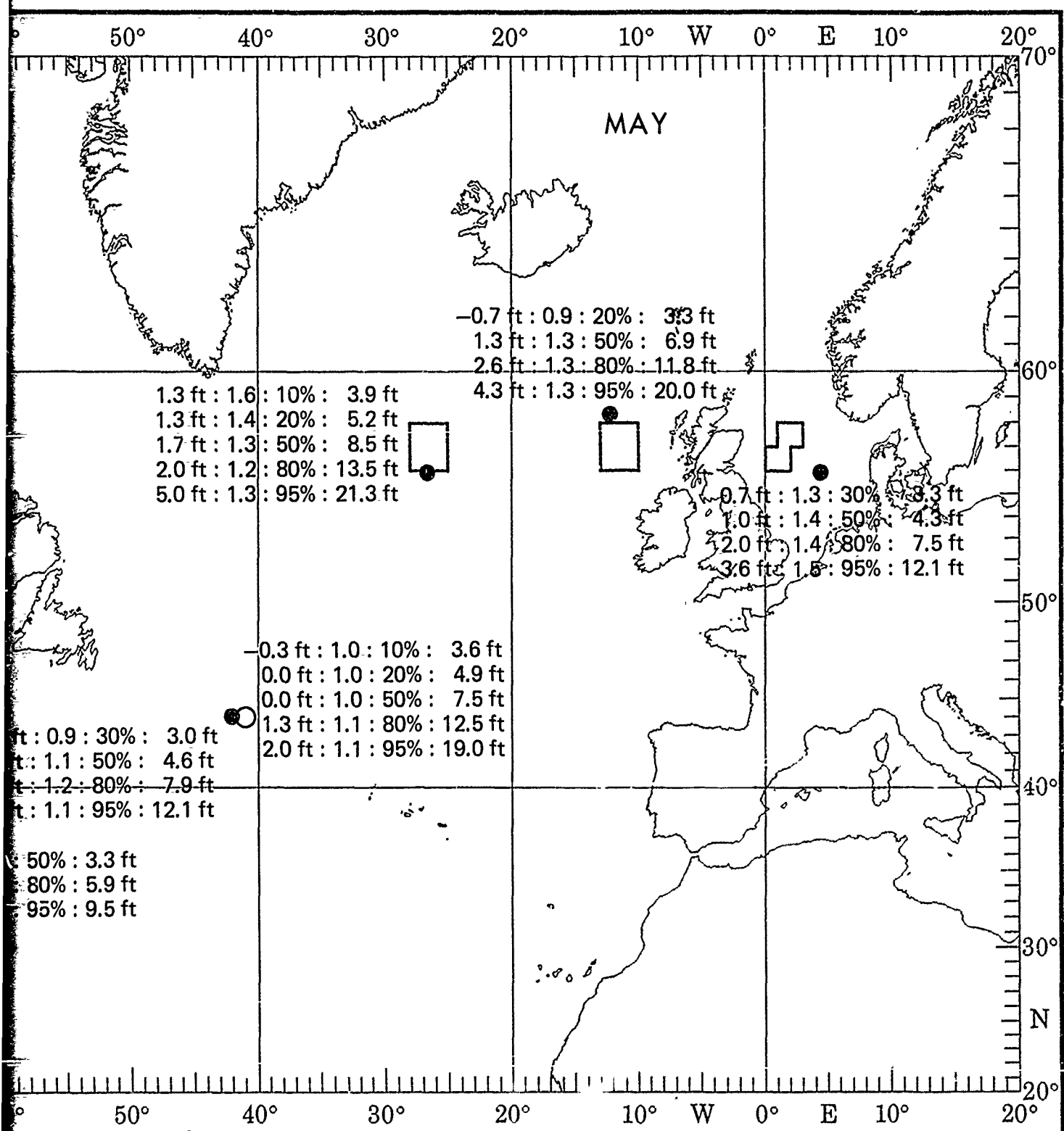
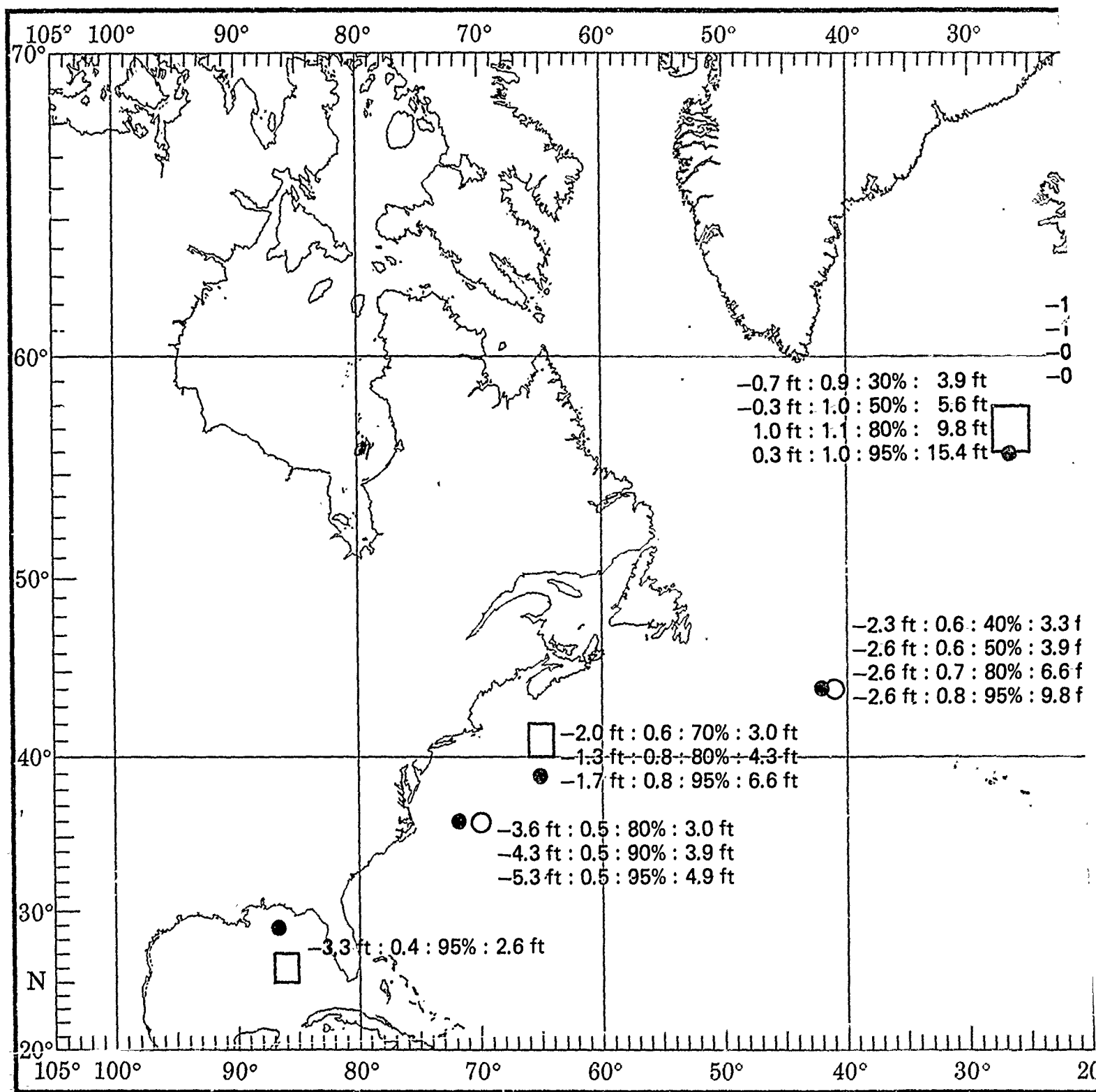


FIG. F7 DIFFERENCE (SOWM-SHIP) AND RATIOS (SOWM/SHIP) OF SOWM AND S PERCENTILES AND THEIR ASSOCIATED WAVE HEIGHTS



# P) OF SOWM AND SHIP WAVE HEIGHTS FOR SELECTED SOWM HTS

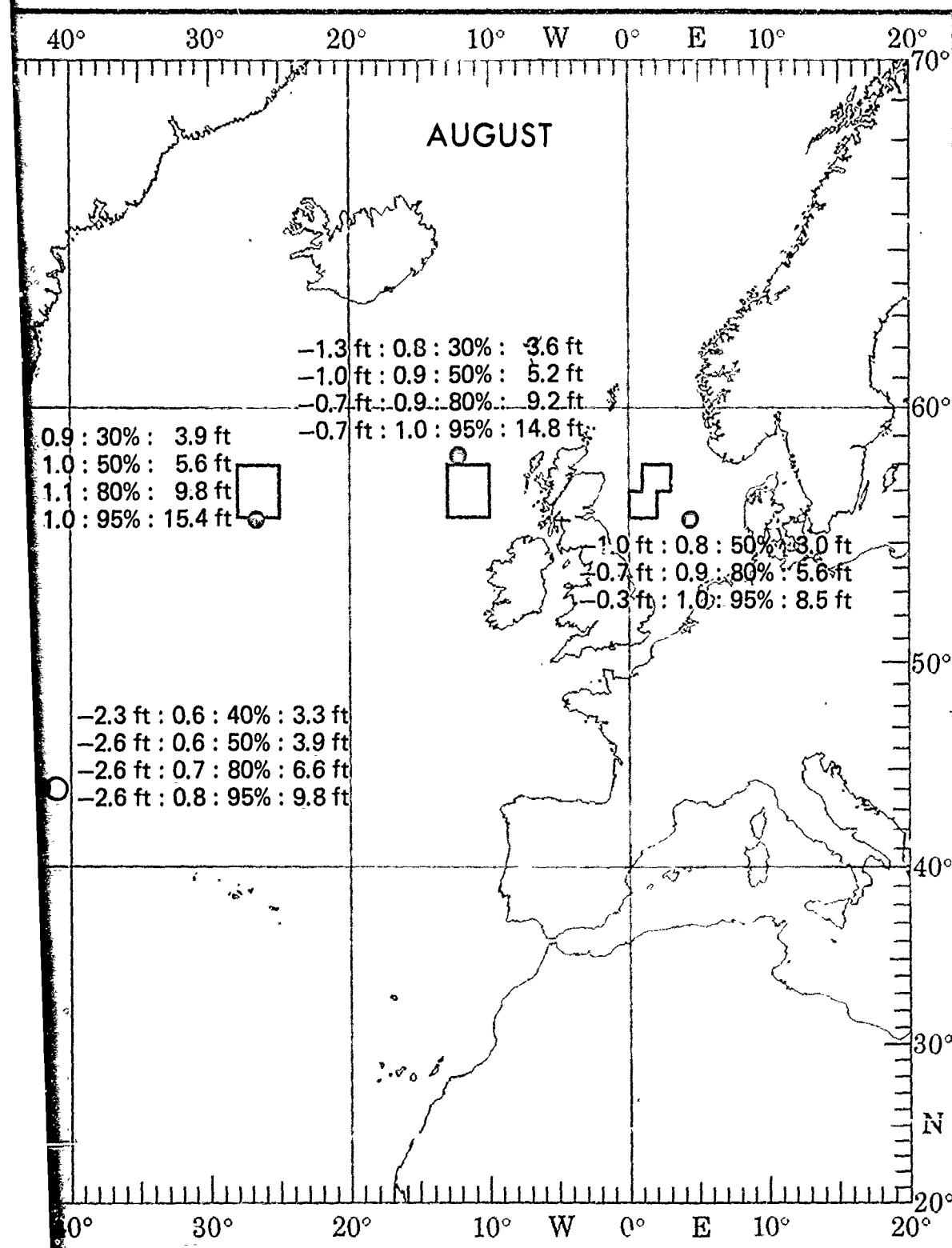
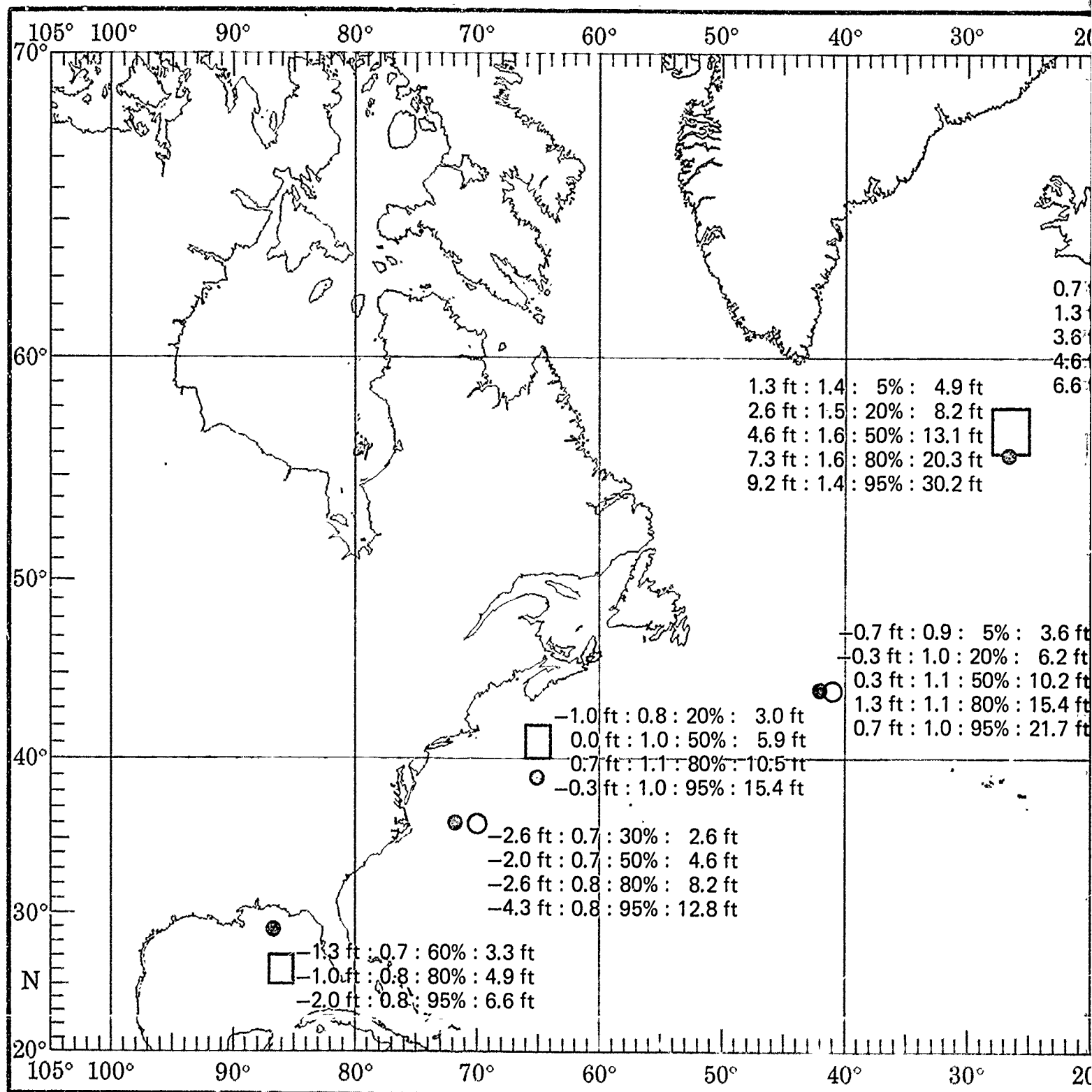




FIG. F8 DIFFERENCE (SOWM-SHIP) AND RATIOS (SOWM/SHIP) OF SOWM AND SHIP PERCENTILES AND THEIR ASSOCIATED WAVE HEIGHTS



# (SOWM/SHIP) OF SOWM AND SHIP WAVE HEIGHTS FOR SELECTED SOWM WAVE HEIGHTS

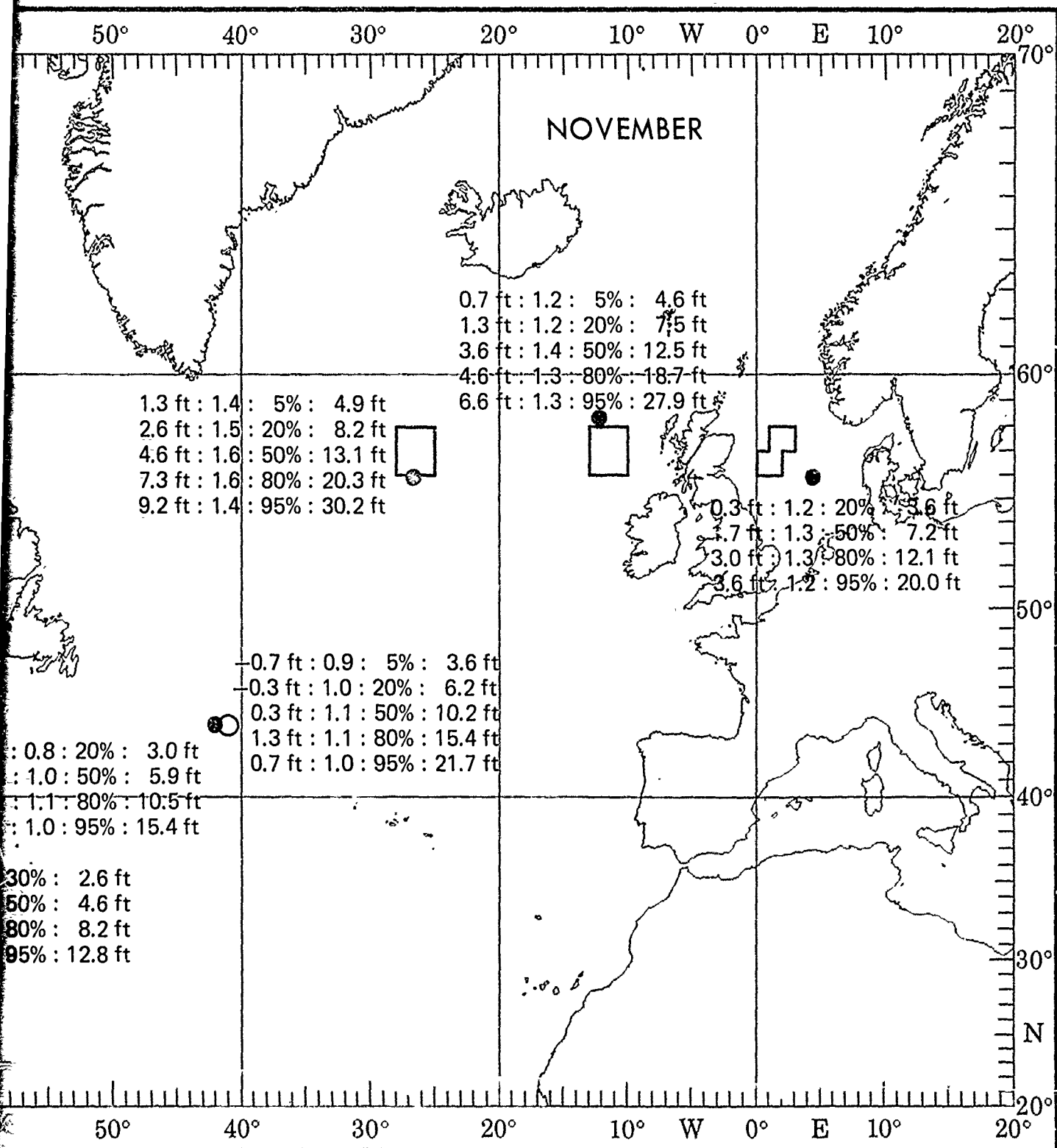


FIG. F9 DIFFERENCE (SOWM-ARMY ) AND RATIOS (SOWM/ARMY) OF SOWM AND ARMY WAVE HEIGHTS FOR SELECTED SOWM PERCENTILES AND THEIR ASSOCIATED WAVE HEIGHTS

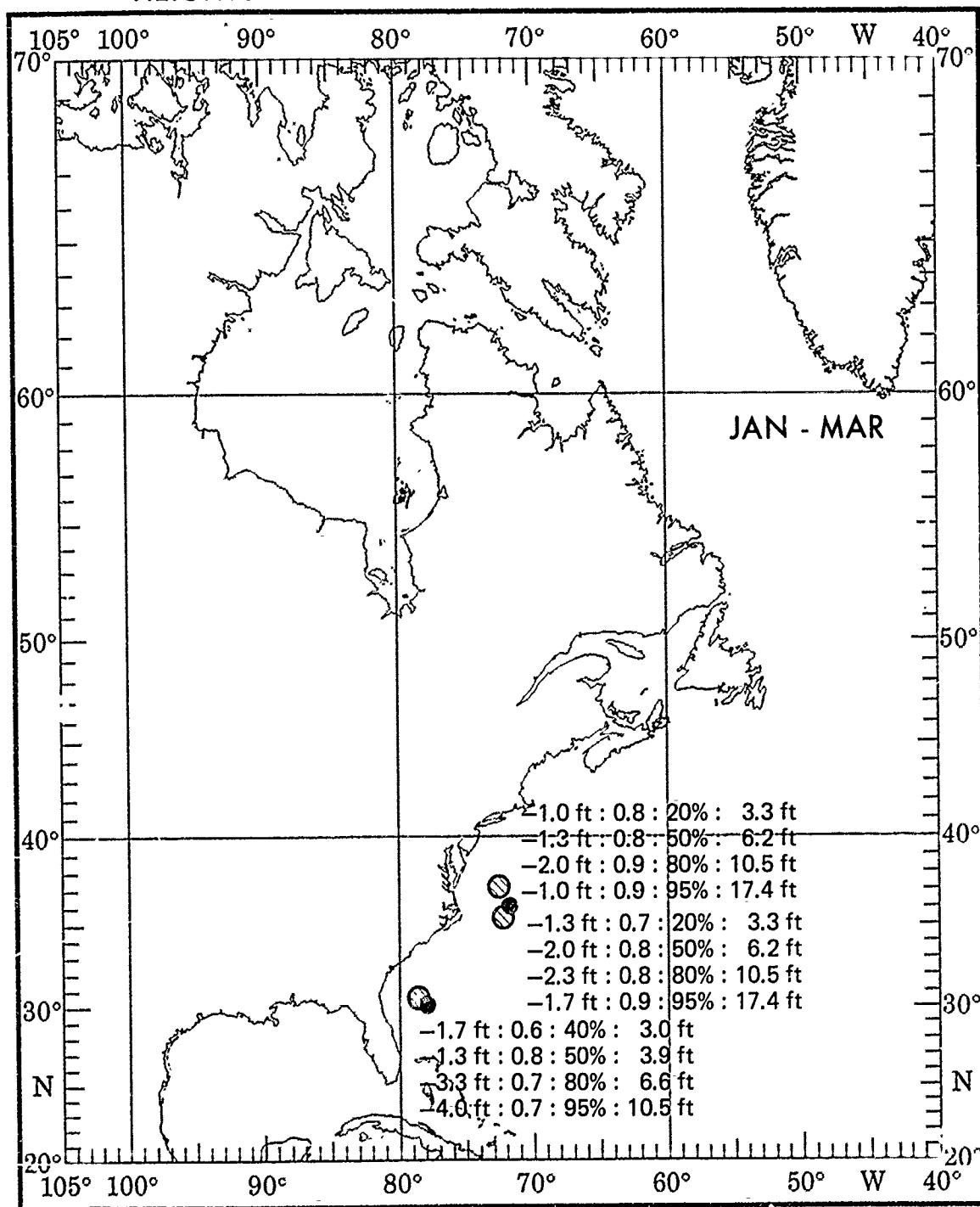


FIG. F10 DIFFERENCE OF SOWM AND ARMY WAVE HEIGHTS FOR SELECTED SOWM PERCENTILES AND THEIR ASSOCIATED WAVE HEIGHTS

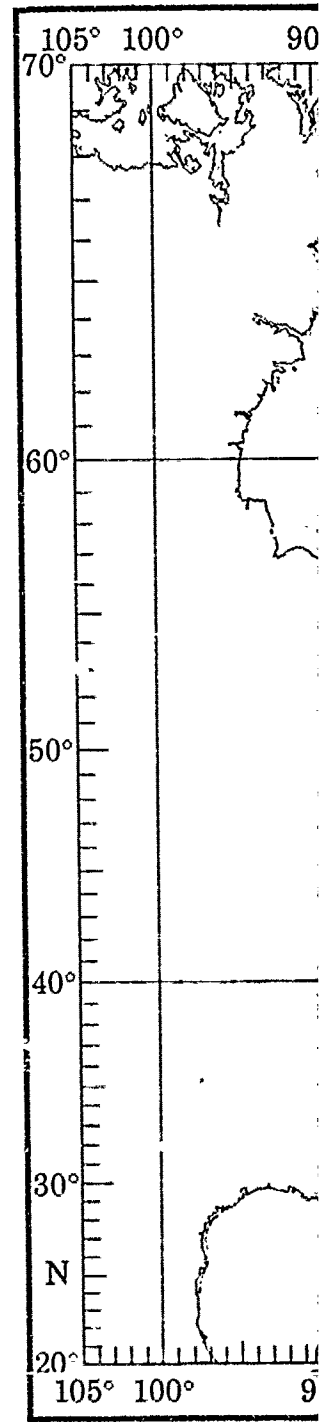


FIG. F10 DIFFERENCE (SOWM-ARMY) AND RATIOS (SOWM/ARMY) OF SOWM AND ARMY WAVE HEIGHTS FOR SELECTED SOWM PERCENTILES AND THEIR ASSOCIATED WAVE HEIGHTS

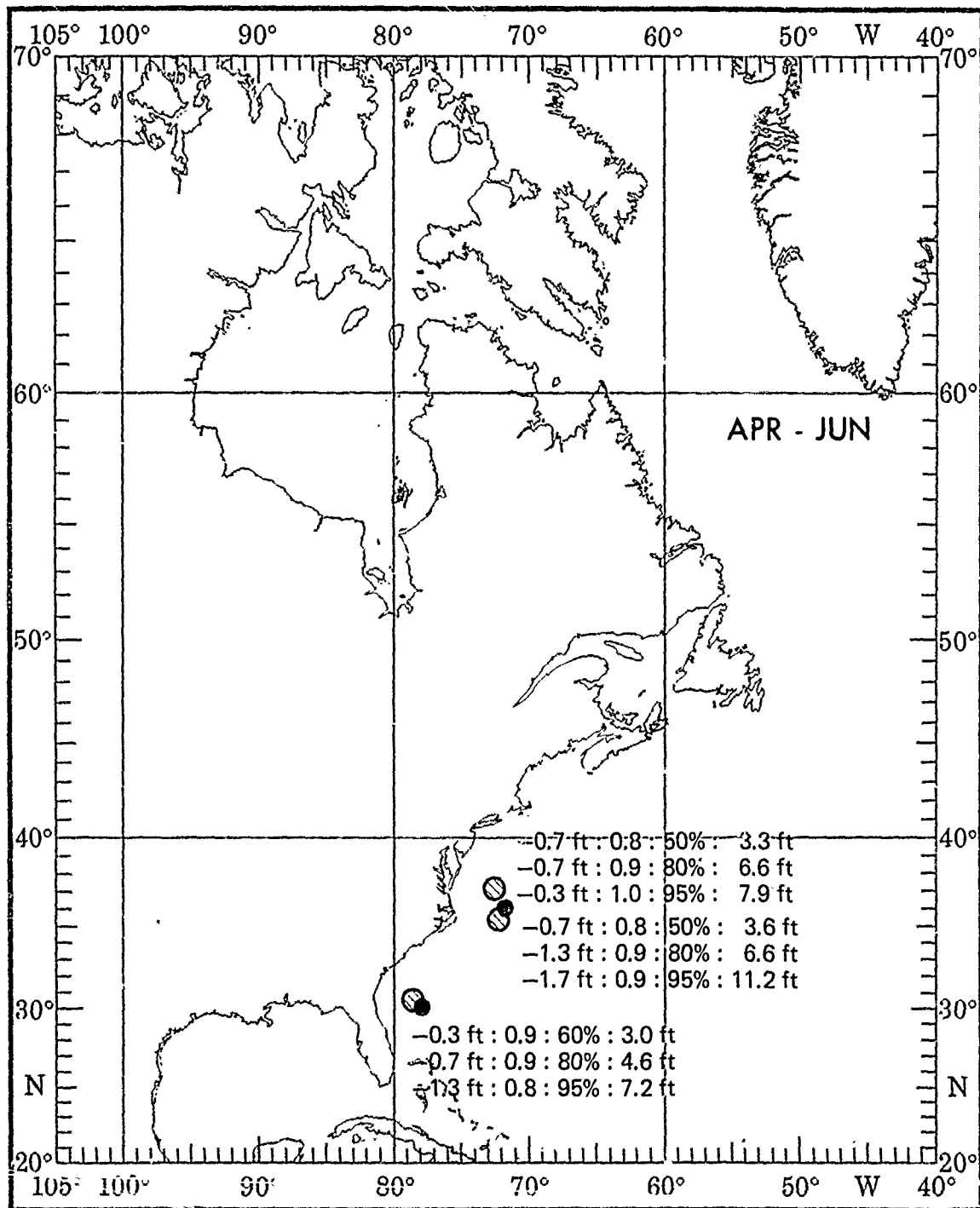


FIG. F11 DIFFERENCE (SOWM-ARMY ) AND RATIOS (SOWM/ARMY)  
OF SOWM AND ARMY WAVE HEIGHTS FOR SELECTED  
SOWM PERCENTILES AND THEIR ASSOCIATED WAVE  
HEIGHTS

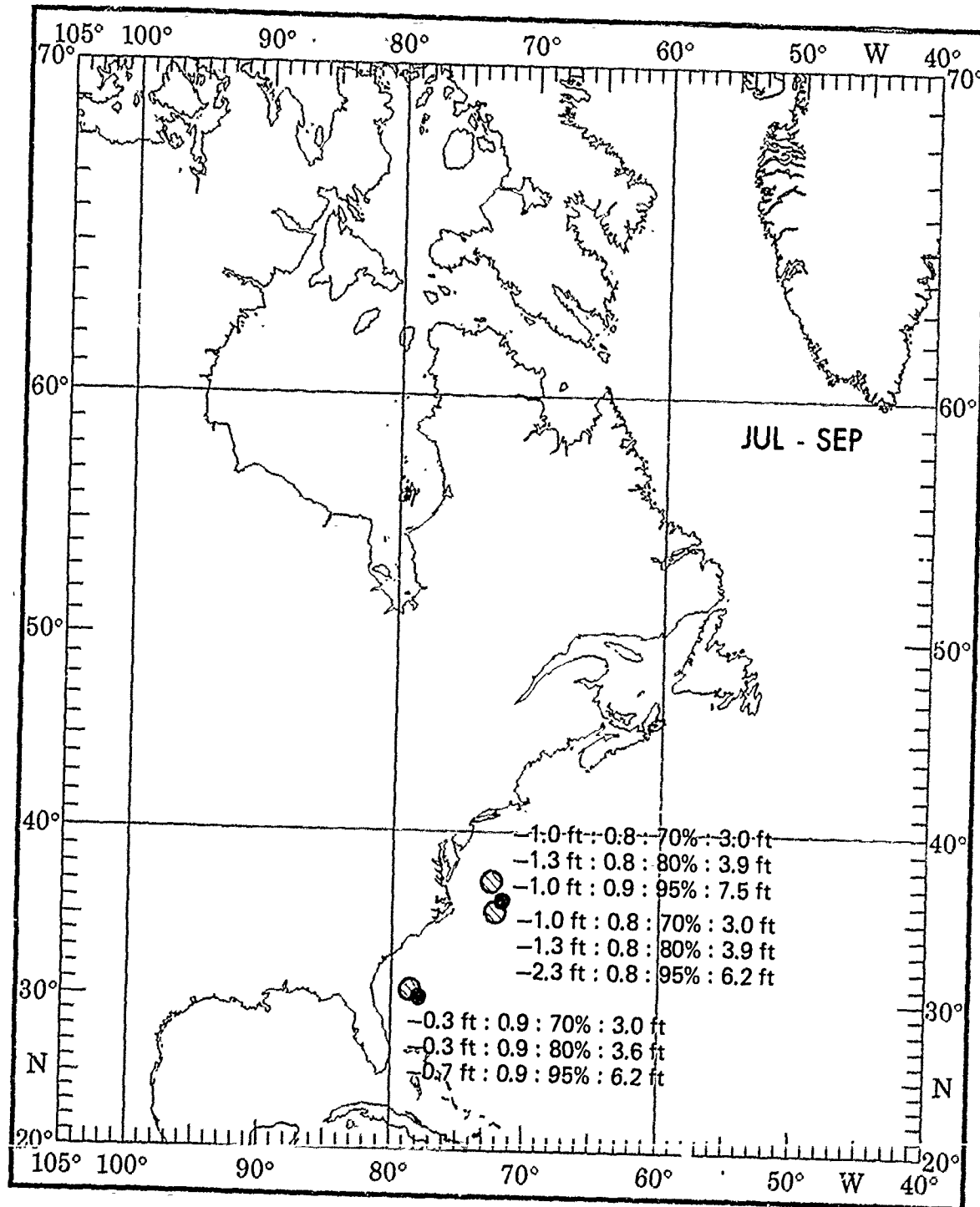
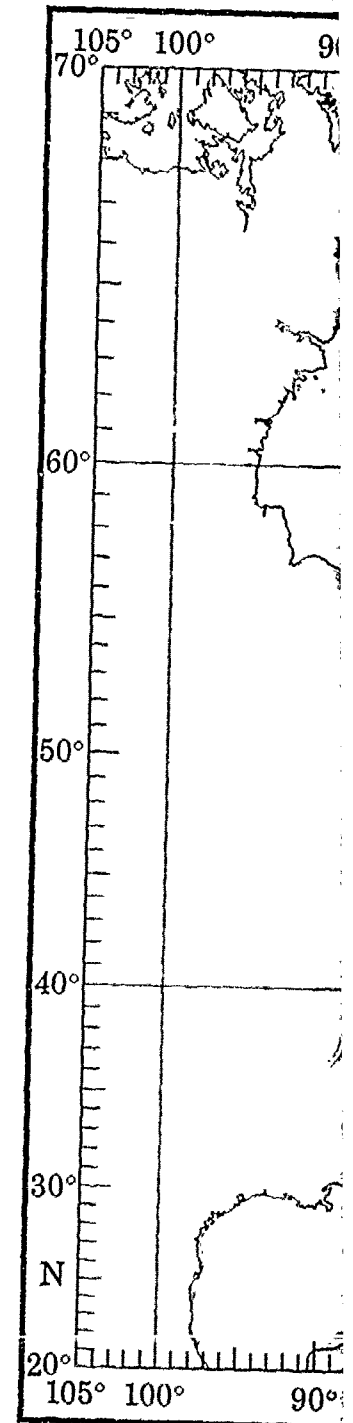


FIG. F12 DIFFEREN  
OF SOV  
SOWM  
HEIGHTS



SOWM/ARMY)  
SELECTED  
WAVE

FIG. F12 DIFFERENCE (SOWM-ARMY ) AND RATIOS (SOWM/ARMY)  
OF SOWM AND ARMY WAVE HEIGHTS FOR SELECTED  
SOWM PERCENTILES AND THEIR ASSOCIATED WAVE  
HEIGHTS

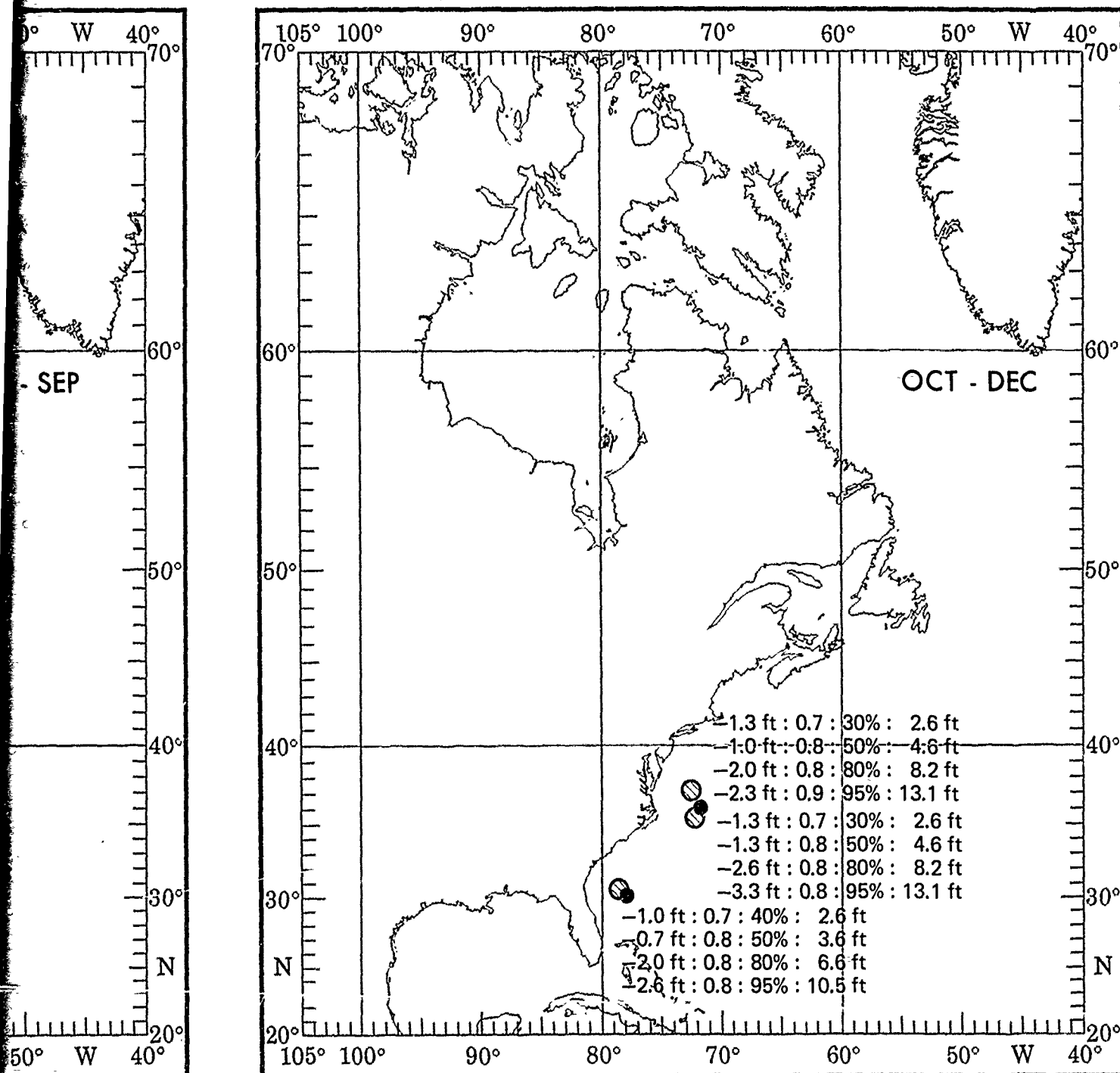




FIG. F13 DIFFERENCE (SOWM-BUOY) AND RATIOS (SOWM/BUOY) OF SOWM AND BUOY WIND SPEEDS FOR SELECTED SOWM PERCENTILES AND THEIR ASSOCIATED WIND SPEEDS

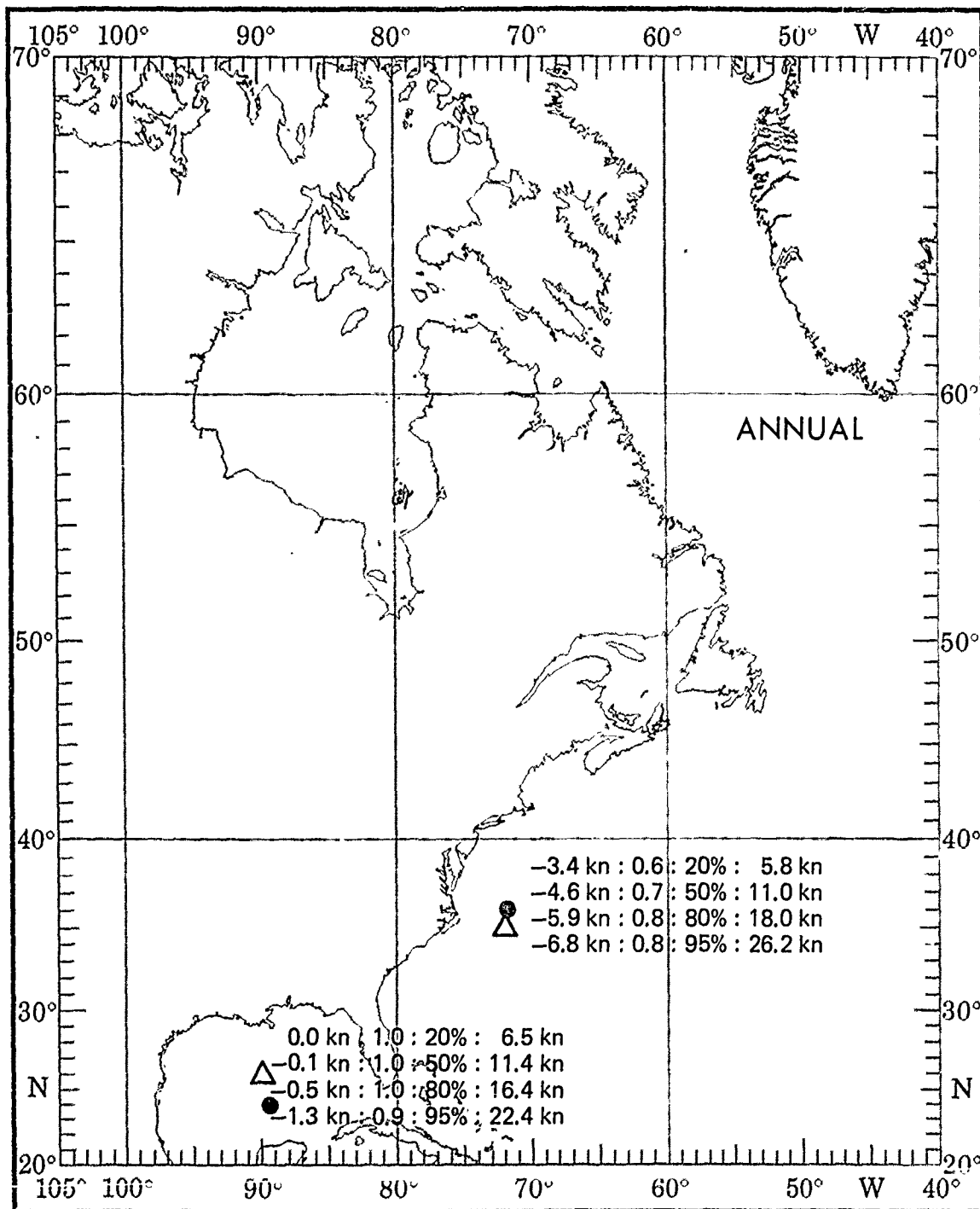


FIG. F14 DIFFERENCE (SOWM-BUOY) AND RATIOS (SOWM/BUOY) OF SOWM AND BUOY WIND SPEEDS FOR SELECTED SOWM PERCENTILES AND THEIR ASSOCIATED WIND SPEEDS

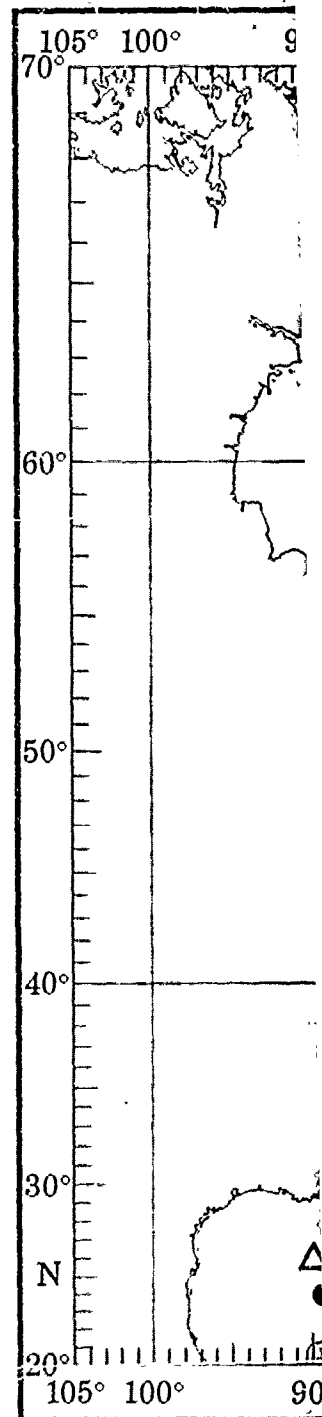
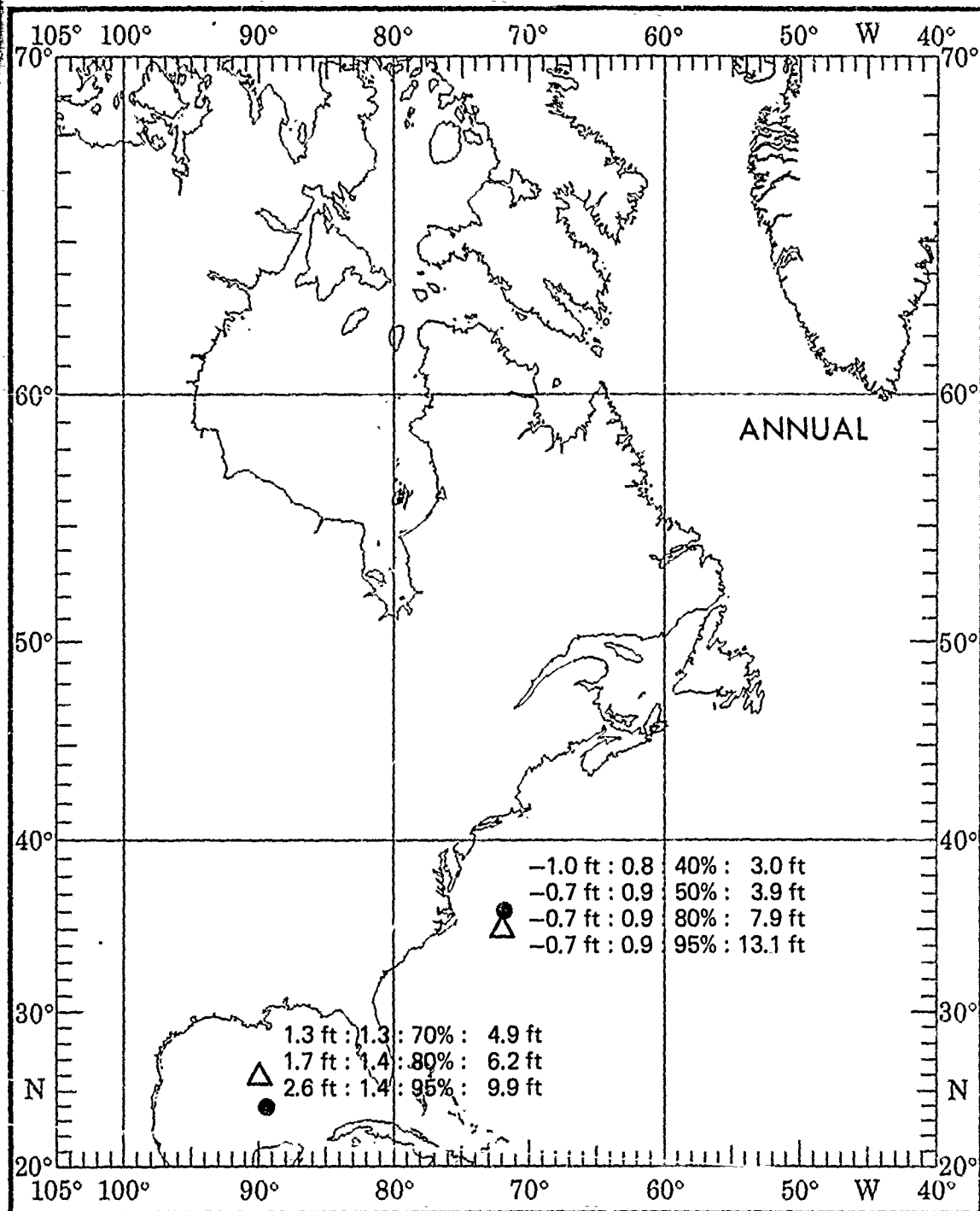


FIG. F14 DIFFERENCE (SOWM-BUOY) AND RATIOS (SOWM/BUOY)  
OF SOWM AND BUOY WAVE HEIGHTS FOR SELECTED  
SOWM PERCENTILES AND THEIR ASSOCIATED WAVE  
HEIGHTS



# BIBLIOGRAPHY

Cardone, Vincent J., 1969: Specification of the wind distribution in the marine boundary layer for wave forecasting. New York University, 147 pp.

Cartwright, D. E., 1964: A comparison of instrumental and visually estimated wave heights and periods recorded on Ocean Weather Ships. Appendix to Hogben, N. and F. E. Lumb, 1964: The presentation of wave data from voluntary observing ships, National Physical Laboratory, SHIP REF. 49.

Cummins, W. E. and S. L. Bales, 1980: Extreme values and rare occurrence wave statistics for Northern Hemispheric shipping lanes. SNAME - STAR.

Darbyshire, M. and L. Draper, 1963: Forecasting wind-generated sea waves. Engineering (London), 195, 482-484.

Dexter, P. E., 1974: Tests of some programmed numerical wave forecast models. J. Phys. Oceanogr., 4, 635-644.

Dobson, F. W., 1981: Review of reference height for averaging time of surface wind measurements at sea. World Meteorological Organization, Marine Meteorology and Related Oceanographic Activities, Report No. 3.

Gentile, D. M., 1982: ORI, Incorporated, Silver Spring, Maryland. Personal communication.

Jardine, T. P., 1979: The reliability of visually observed wave heights. Coastal Engineering, 3, 33-38.

\_\_\_\_\_ and F. R. Lathan, 1981: An analysis of wave height records for the Northeast Atlantic. Q.J.R.M.S., 107, 415-426.

Lazanoff, S. M., 1981: Fleet Numerical Oceanography Center, Monterey, California. Personal communication.

Mendenhall, B. R., M. M. Hale, and J. Cumming, 1977: Development of a history of analyzed sea level pressure and diagnosed wind fields. Fleet Numerical Weather Central, N00228-76-C3273, Monterey 93940, June 1977.

Nordenstrom, N., 1969: Methods for predicting long-term distributions of wave loads, probability of failure for ships. App. Relationships between visually estimated theoretical wave heights and periods, Report No. 69-21-5, Oslo, Norway.

Pierson, W. J., Jr., 1982: The spectral wave model (SOWM), a Northern Hemisphere computer model for specifying and forecasting ocean wave spectra. David W. Taylor Ship Research and Development Center DTNSRDC-82/011, Bethesda, Maryland 20 July 1982.

Pierson, W. J., Jr., G. Newman, and R. W. J. 1955: Practical Methods of Observing Forecasting Ocean Waves by Means of Spectra and Statistics, U. S. Hydrographic Office.

Quayle, R. G., 1974: A climatic comparison of ocean weather stations and transient records. Mariners Weather Log, 18, 307-3

Quayle, R. G., 1980: Climatic comparison of estimated and measured winds from ship. JAM, 19, 142-156.

Quayle, R. G. and M. J. Changery, Preliminary height and period adjustments to visual wave data. Mariners Weather Log, 2-3.

Resio, D. T., 1981: The estimation of wind generation in a discrete spectral model. J. Phys. Oceanogr., 11, 511-525.

Resio, D. T. and C. L. Vincent, 1979: comparison of various numerical prediction techniques. Presented at Offshore Technology Conference, Houston, Mar. 7 Soc. and Amer. Soc. of Civ. Eng., Paper 36

Mendenhall, B. R., M. M. Hale, and M. J. Cumming, 1977: Development of a marine history of analyzed sea level pressure fields and diagnosed wind fields. Fleet Numerical Weather Central, N00228-76-C3273, Monterey, CA 93940, June 1977.

Nordenstrom, N., 1969: Methods for predicting long-term distributions of wave loads and probability of failure for ships. App. II, Relationships between visually estimated and theoretical wave heights and periods, DnV Report No. 69-21-5, Oslo, Norway.

Pierson, W. J., Jr., 1982: The spectral ocean wave model (SOWM), a Northern Hemisphere computer model for specifying and forecasting ocean wave spectra. David W. Taylor Naval Ship Research and Development Center, DTNSRDC-82/011, Bethesda, Maryland 20084, July 1982.

Pierson, W. J., Jr., G. Newmar, and R. W. James, 1955: Practical Methods of Observing and Forecasting Ocean Waves by Means of Wave Spectra and Statistics, U. S. Navy Hydrographic Office.

Quayle, R. G., 1974: A climatic comparison of ocean weather stations and transient ship records. Mariners Weather Log, 18, 307-311.

Quayle, R. G., 1980: Climatic comparisons of estimated and measured winds from ships. JAM, 19, 142-156.

Quayle, R. G. and M. J. Changery, 1982: Preliminary height and period adjustments for visual wave data. Mariners Weather Log, 26, 2-3.

Resio, D. T., 1981: The estimation of wind-wave generation in a discrete spectral model. J. Phys. Oceanogr., 11, 511-525.

Resio, D. T. and C. L. Vincent, 1979: A comparison of various numerical wave prediction techniques. Presented at Offshore Technology Conference, Houston, Mar. Tech. Soc. and Amer. Soc. of Civ. Eng., Paper 3642.

U. S. Army Hydraulics Laboratory: Surface Pressure Field Reconstruction for Wave Hindcasting Purposes, WIS Report 1, July 1980. U. S. Army Engineer Waterways Experiment Station, P. O. Box 631, Vicksburg, Mississippi 39180.

U. S. Army Hydraulics Laboratory: Atlantic Coast Hindcast, Deep Water, Significant Wave Information, WIS Report 2, January 1981. U. S. Army Engineer Waterways Experiment Station, P. O. Box 631, Vicksburg, Mississippi 39180.

U. S. Army Hydraulics Laboratory: Objective Specification of Atlantic Ocean Wind Fields from Historical Data, WIS Report 4, May 1982. U. S. Army Engineer Waterways Experiment Station, P. O. Box 631, Vicksburg, Mississippi 39180.

U. S. Department of Commerce: Climatic Summaries for NOAA Data Buoys. January 1983. National Oceanic and Atmospheric Administration, National Weather Service NOAA Data Buoy Center, NSTL Station, Mississippi 39529.

U. S. Navy, Naval Weather Service Command: Marine Climatic Atlas of the World, Volume 1 (Revised), North Atlantic Ocean. NAVAIR 50-1C-528, 1974.

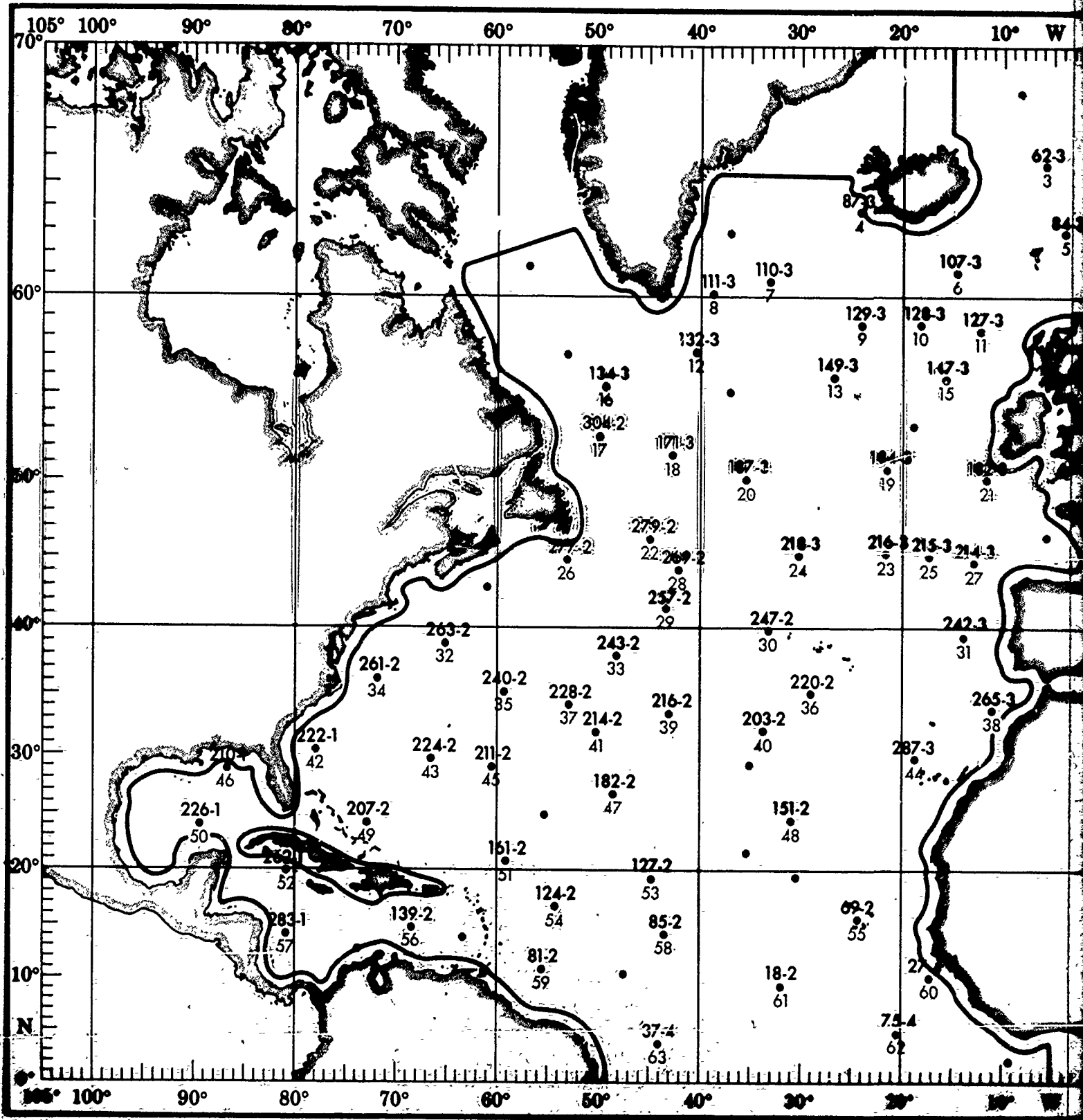
U. S. Navy, Naval Weather Service Command: Numerical Environmental Products Manual. NAVAIR 50-1G-522, June 1975.

World Meteorological Organization, 1960: Guide to Climatological Practices (Supplement No. 5, 1966). Geneva, Switzerland, P. IX. 32.

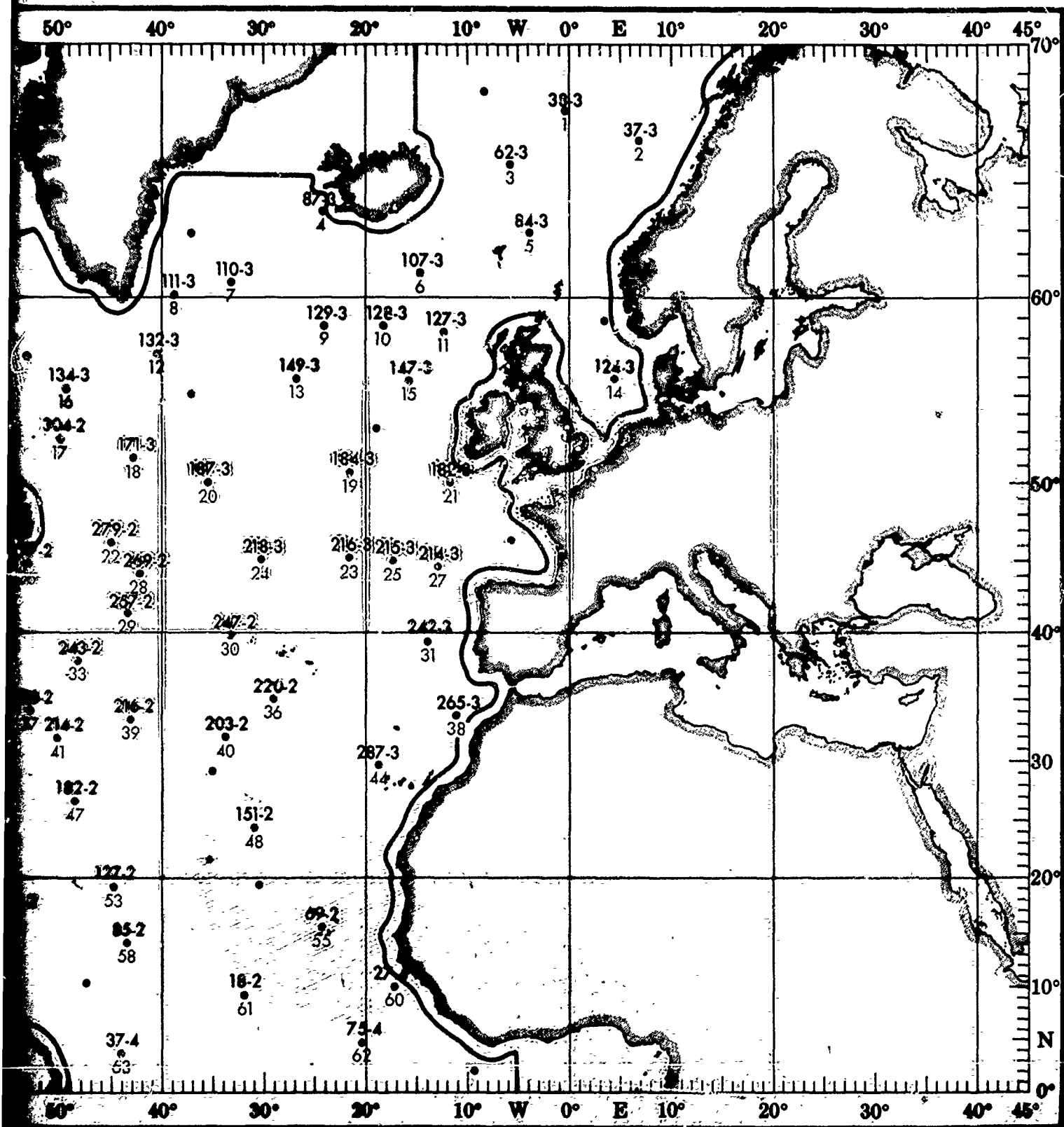
World Meteorological Organization, 1976: Handbook on Wave Analysis and Forecasting WMO No. 446, Geneva, Switzerland.

World Meteorological Organization, 1981: WMO Guide to Marine Meteorological Services, 1981. See WMO Resolution 35 (Congress IV) as amended by recommendation 36 (1968-CMM).

# GRID POINT-SUBPROJECTION AND SEQUENCE NUMBER



# NT-SUBPROJECTION AND SEQUENCE NUMBERS





## WIND SPEED DURATIONS - ALL DAYS

SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

WIND SPEED	1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T*	TH
≥ 48	10	5	1	1									125.1	18	32	13606
≥ 41	46	15	6	1	6								175.2	74	131	13606
≥ 34	62	45	34	15	15	2							300.1	173	433	13606
≥ 28	123	94	64	29	59	13	3						350.1	385	1136	13606
≥ 22	137	121	94	77	133	31	12	6	6				825.1	617	2527	13606
≥ 17	158	144	100	99	214	75	37	16	17	2			1125.1	862	4590	13606
≥ 11	123	107	73	86	251	148	74	53	63	8	2		2275.1	988	8418	13606
≥ 7	97	45	38	51	129	126	83	50	135	39	3		2825.1	798	11074	13606
≥ 4	301	17	19	14	57	49	41	26	93	68	26	1	361.00	1442	12384	12640

DAYS DURATION OF EVENTS

17 Events with wind speeds  $\geq 4$  kn. persisted 0.5 day; 57 events persisted  $>1$  day but  $\leq 2$  days.

The longest event with wind speeds  $\geq 41$  kn. persisted 1.75 days and it occurred 2 times.

The longest event with wind speeds  $\geq 34$  kn. persisted 3 days and it occurred 1 time.

442 Events had wind speeds  $\geq 4$  kn. which comprised a total of 12,384 hindcasts.

13,606 Hindcasts were examined, and 12,640 had wind speeds  $\geq 4$  kn.

Durations extend from the time the event begins and terminate when the event ends. Events become undefined if missing data is encountered.

## WAVE HEIGHT INTERVALS - ALL DAYS

SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

WAVE HEIGHT	1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T*	TH
≥ 64																13606
≥ 56																13606
≥ 48																13606
≥ 41																13606
≥ 34																13606
≥ 28																13606
≥ 22																13606
≥ 17																13606
≥ 11																13606
≥ 7																13606
≥ 4																13606

DAYS INTERVAL BETWEEN EVENTS

1 Interval between events of wave heights  $\geq 34$  ft. (10.4m) persisted 0.5 day; 2 intervals persisted  $>1$  day but  $\leq 2$  days.

The longest interval between events of wave heights  $\geq 3$  ft. (0.9m) was 18.25 days and it occurred 2 times.

The longest interval between events of wave heights  $\geq 40$  ft. was 308.25 days and it occurred 1 time.

There were 401 intervals between events of wave heights  $\geq 3$  ft. (0.9m) which comprised a total of 3,133 hindcasts.

13,606 Hindcasts were examined, and 3,208 had wave heights  $<3$  ft. (0.9m).

Intervals extend from the time the event ends and terminate when the event begins. Intervals become undefined if missing data is encountered.

### ABBREVIATIONS (See text for details)

MAX: Maximum duration or interval, followed by the number of occurrences.

TE or TI: Total number of events or intervals.

T: Total number of hindcasts included in TE or TI.

T\*: Total number of hindcasts that met the stated criteria.

TH: Total number of hindcasts examined.

## LEGENDS FOR TABLES

### WIND SPEED INTERVALS - ALL DAYS

SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

WIND SPEED	1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T*	TH
≥ 48																13606
≥ 41																13606
≥ 34																13606
≥ 28																13606
≥ 22																13606
≥ 17																13606
≥ 11																13606
≥ 7																13606
≥ 4																13606

DAYS INTERVAL BETWEEN EVENTS

1 Interval between events of wind speeds  $\geq 48$  kn. persisted 0.5 day; 4 intervals persisted  $>1$  day but  $\leq 2$  days.

The longest interval between events of wind speeds  $\geq 4$  kn. was 6.25 days and it occurred 1 time.

The longest interval between events of wind speeds  $\geq 7$  kn. was 8.75 days and it occurred 2 times.

There were 451 intervals between events of wind speeds  $\geq 4$  kn. which comprised a total of 963 hindcasts.

13,606 Hindcasts were examined, and 966 had wind speeds  $<4$  kn.

Intervals extend from the time the event ends and terminate when the event begins. Intervals become undefined if missing data is encountered.

### WAVE SLOPE $\alpha$ DURATIONS - ALL DAYS

SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

WAVE SLOPE $\alpha$	1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T*	TH
≥ 15																13606
≥ 14																13606
≥ 13																13606
≥ 12																13606
≥ 11																13606
≥ 10																13606
≥ 9																13606
≥ 8																13606
≥ 7																13606
≥ 6																13606
≥ 5																13606
≥ 4																13606
≥ 3																13606
≥ 2																13606
≥ 1																13606

DAYS DURATION OF EVENTS

32 Events with  $\alpha \geq 0.01$  persisted .25 day; 19 events persisted  $>1$  day but  $\leq 2$  days.

The longest event with  $\alpha \geq 0.12$  persisted 3.25 days and it occurred 1 time.

The longest event with  $\alpha \geq 0.13$  persisted 1.50 days and it occurred 2 times.

267 Events had  $\alpha \geq 0.01$  which comprised a total of 20,760 hindcasts.

29,016 Hindcasts were examined, and 28,054 had  $\alpha \geq 0.01$ .

Durations extend from the time the event begins and terminate when the event ends. Events become undefined if missing data is encountered.

# LEGENDS FOR TABLES

## INTERVALS - ALL DAYS

SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T	T*	TH
1	10	4	4	1	12	11	5	6	3	1	2	2	418.00-1	13	5944	13606
6	22	15	19	4	30	27	9	7	2	1	4	5	324.00-1	68	8829	13606
26	61	43	34	25	46	38	7	7	2	3	1	1	208.50-1	167	9580	13173
53	132	79	44	27	53	32	9	4	5	2	1	1	181.75-1	380	10399	12465
75	197	96	42	24	67	36	6	2	1	1	1	1	115.75-1	613	10594	11070
102	196	62	38	24	20	6	1	1	1	1	1	1	50.25-1	859	8875	9001
121	196	62	38	24	20	6	1	1	1	1	1	1	16.25-1	988	5108	5134
151	35	8	1	1	1	1	1	1	1	1	1	1	8.75-2	798	2376	2387
151	35	8	1	1	1	1	1	1	1	1	1	1	6.25-1	451	963	966

1 between events of wind speeds  $\geq 48$  kn. persisted 0.5 intervals persisted  $>1$  day but  $\leq 2$  days.  
 1st interval between events of wind speeds  $\geq 4$  kn. was 1 and it occurred 1 time.  
 1st interval between events of wind speeds  $\geq 7$  kn. was 2 and it occurred 2 times.  
 451 intervals between events of wind speeds which comprised a total of 963 hindcasts.  
 13,606 hindcasts were examined, and 966 had wind speeds  $<4$  kn.  
 Durations extend from the time the event ends and terminate when the event begins. Intervals become undefined if missing data is encountered.

## α DURATIONS - ALL DAYS

SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T	T*	TH
1	5	4	1	1	1	1	1	1	1	1	1	1	50.3	5	8	8
21	29	2	1	1	1	1	1	1	1	1	1	1	75.3	20	31	31
46	108	27	3	3	1	1	1	1	1	1	1	1	150.2	64	142	145
81	183	99	31	15	16	1	1	1	1	1	1	1	3.25-1	180	525	531
105	265	206	116	69	138	40	4	1	1	1	1	1	4.25-3	430	1633	1648
125	241	155	129	99	197	88	18	5	1	1	1	1	9.50-1	878	4415	4450
151	200	138	110	94	192	100	24	12	1	1	1	1	23.75-1	1411	14261	14466
175	241	155	129	99	197	88	18	5	1	1	1	1	35.50-1	1311	20361	20904
200	200	138	110	94	192	100	24	12	1	1	1	1	43.00-1	1211	21835	22909
225	200	138	110	94	192	100	24	12	1	1	1	1	58.50-1	1111	22954	24429
250	200	138	110	94	192	100	24	12	1	1	1	1	67.75-1	895	23326	25663
275	200	138	110	94	192	100	24	12	1	1	1	1	90.75-1	613	22003	26905
300	200	138	110	94	192	100	24	12	1	1	1	1	1361.75-1	267	20760	28054

1 with  $\alpha \geq 0.01$  persisted .25 day; 19 events persisted  $>1$  day but  $\leq 2$  days.  
 1st event with  $\alpha \geq 0.12$  persisted 3.25 days and it occurred 1 time.  
 1st event with  $\alpha \geq 0.13$  persisted 1.50 days and it occurred 2 times.  
 20,760 events had  $\alpha \geq 0.01$  which comprised a total of 20,760 hindcasts.  
 28,054 hindcasts were examined, and 28,054 had  $\alpha \geq 0.01$ .  
 Durations extend from the time the event begins and terminate when the event ends. Events become undefined if missing data is encountered.

Number of occurrences.

## WAVE HEIGHT DURATIONS - ALL DAYS

SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T	T*	TH
1	10	4	4	1	12	11	5	6	3	1	2	2	100.1	4	10	10
6	22	15	19	4	30	27	9	7	2	1	4	5	150.1	12	33	33
26	61	43	34	25	46	38	7	7	2	3	1	1	200.2	36	97	97
53	132	79	44	27	53	32	9	4	5	2	1	1	250.1	82	272	272
75	197	96	42	24	67	36	6	2	1	1	1	1	450.1	139	663	669
102	196	62	38	24	20	6	1	1	1	1	1	1	1000.1	231	1392	1402
121	196	62	38	24	20	6	1	1	1	1	1	1	1575.1	367	2833	2845
151	35	8	1	1	1	1	1	1	1	1	1	1	2050.1	438	4603	4616
151	35	8	1	1	1	1	1	1	1	1	1	1	3450.1	477	6932	6994
151	35	8	1	1	1	1	1	1	1	1	1	1	136100.1	393	10094	10398

33 Events with wave heights  $\geq 3$  ft. (0.9m) persisted 0.5 day; 68 events persisted  $>1$  day but  $\leq 2$  days.  
 The longest event with wave heights  $\geq 28$  ft. (8.5m) persisted 2 days and occurred 2 times.  
 The longest event with wave heights  $\geq 24$  ft. (7.3m) persisted 2.5 days and occurred 1 time.  
 393 Events had wave heights  $\geq 3$  ft. (0.9m) which comprised a total of 10,094 hindcasts.  
 13,606 Hindcasts were examined, and 10,398 had wave heights  $\geq 3$  ft. (0.9m).  
 Durations extend from the time the event begins and terminate when the event ends. Events become undefined if missing data is encountered.

## WAVE SLOPE α INTERVALS - ALL DAYS

SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

1	2	3	4	5	10	20	30	60	90	180	360	MAX	TE	T	T*	TH
1	5	4	1	1	1	1	1	1	1	1	1	1	16.25-1	2	79	29008
21	29	2	1	1	1	1	1	1	1	1	1	1	44.75-1	9	754	28985
46	108	27	3	3	1	1	1	1	1	1	1	1	387.75-1	49	11986	28871
81	183	99	31	15	16	1	1	1	1	1	1	1	258.75-1	165	19432	28485
105	265	206	116	69	138	40	4	1	1	1	1	1	202.25-1	415	23046	27368
125	241	155	129	99	197	88	18	5	1	1	1	1	127.50-1	866	22585	24566
151	200	138	110	94	192	100	24	12	1	1	1	1	47.75-1	1411	14399	14550
175	241	155	129	99	197	88	18	5	1	1	1	1	15.00-1	1311	8040	8112
200	200	138	110	94	192	100	24	12	1	1	1	1	14.50-1	1211	6040	6107
225	200	138	110	94	192	100	24	12	1	1	1	1	14.50-1	1112	4577	4587
250	200	138	110	94	192	100	24	12	1	1	1	1	8.50-1	910	3347	3353
275	200	138	110	94	192	100	24	12	1	1	1	1	8.00-1	631	2109	2111
300	200	138	110	94	192	100	24	12	1	1	1	1	5.25-2	286	961	962

2 Intervals between events of wave slopes  $\geq 0.13$  persisted 0.5 day; 1 interval persisted  $>1$  day but  $\leq 2$  days.  
 The longest interval between events of wave slopes  $\geq 0.15$  was 16.25 days and it occurred 1 time.  
 The longest interval between events of wave slopes  $\geq 0.01$  was 5.25 days and it occurred 2 times.  
 There were 286 intervals between events of wave slopes  $\geq 0.01$  which comprised a total of 961 hindcasts.  
 29,016 Hindcasts were examined, and 962 had wave slopes  $<0.01$ .  
 Intervals extend from the time the event begins and terminate when the event ends. Events become undefined if missing data is encountered.

feet 9 16 24  
 0.36 12 20 28 34 40 48 56 64  
 meters 0.11 3.7 6.1 8.5 12.2 14.6 17.1 19.5  
 0.9 2.7 4.9 7.3 10.4

# LEGENDS FOR TABLES

## WIND SPEED DURATIONS - MONTHLY

		SEQUENCE NUMBER 99 GRID POINT SUBPROJECTION NUMBER 999-9															
WIND SPEED	DURATION	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96+
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
≥64																	1235
≥48																	9
≥34																	1235
≥28																	1235
≥22																	1235
≥17																	1235
≥11																	1235
≥7																	1235
≥4																	1235
≥0																	1235

1 Event with wind speeds  $\geq 7$  kn. persisted 12 hours; 26 events persisted  $\geq 96$  hours.

The longest event with wind speeds  $\geq 7$  kn. persisted for 1 month or more and it occurred 2 times.

The longest event with wind speeds  $\geq 48$  kn. persisted 18 hours and it occurred 1 time.

41 Events had wind speeds  $\geq 4$  kn. which comprised a total of 1,336 hindcasts.

1,483 Hindcasts were examined, and 1,443 had wind speeds  $\geq 4$  kn.

Durations for a particular month extend from the time the event begins (or the first of the month if already in progress), and terminate when the event ends. Events become undefined if missing data is encountered. Durations lasting a month or more are categorized together. Durations may persist into the next month(s).

## WIND SPEED INTERVALS - MONTHLY

		SEQUENCE NUMBER 99 GRID POINT SUBPROJECTION NUMBER 999-9															
WIND SPEED	INTERVAL	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96+
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
≥64																	1235
≥48																	9
≥34																	1235
≥28																	1235
≥22																	1235
≥17																	1235
≥11																	1235
≥7																	1235
≥4																	1235
≥0																	1235

There were 18 12-hour intervals between events of wind speeds  $\geq 17$  kn.; 4 intervals persisted 96 hours or more.

The longest interval between events of wind speeds  $\geq 7$  kn.

was 36 hours and it occurred 1 time. The longest interval between events of wind speeds  $\geq 64$  kn. was 1 month or more and it occurred 9 times.

There were 32 intervals between events of wind speeds  $\geq 4$  kn. which comprised a total of 40 hindcasts.

1,235 Hindcasts were examined, and 40 had wind speeds  $\geq 4$  kn.

Intervals for a particular month extend from the time the event ends (or the first of the month if the event is not in progress), and terminate when the event begins. Intervals become undefined if missing data is encountered. Intervals lasting a month or more are categorized together. Intervals may persist into the next month(s).

## WAVE HEIGHT INTERVALS - MONTHLY

		SEQUENCE NUMBER 99 GRID POINT SUBPROJECTION NUMBER 999-9															
WAVE HEIGHT	INTERVAL	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96+
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
≥64																	1235
≥48																	9
≥34																	1235
≥28																	1235
≥22																	1235
≥17																	1235
≥11																	1235
≥7																	1235
≥4																	1235
≥0																	1235

There were 13 12-hour intervals between events of wave heights  $\geq 9$  ft. (2.7m); 4 intervals persisted 96 hours or more.

The longest interval between events of wave heights  $\geq 6$  ft. (1.8m) was 132 hours and it occurred 1 time.

The longest interval between events of wave heights  $\geq 64$  ft. (19.5m) was 1 month or more and it occurred 9 times.

There were 13 intervals between events of wave heights  $\geq 3$  ft. (0.9m) which comprised a total of 23 hindcasts.

1,235 Hindcasts were examined, and 23 had wave heights  $\geq 3$  ft. (0.9m).

Intervals for a particular month extend from the time the event ends (or the first of the month if the event is not in progress), and terminate when the event begins. Intervals become undefined if missing data is encountered. Intervals lasting a month or more are categorized together. Intervals may persist into the next month(s).

## WAVE SLOPE $\alpha$ DURATIONS - MONTHLY

		SEQUENCE NUMBER 99 GRID POINT SUBPROJECTION NUMBER 999-9															
WAVE SLOPE	DURATION	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96+
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
≥15																	2440
≥14																	2440
≥13																	2440
≥12																	2440
≥11																	2440
≥10																	2440
≥9																	2440
≥8																	2440
≥7																	2440
≥6																	2440
≥5																	2440
≥4																	2440
≥3																	2440
≥2																	2440
≥1																	2440

2 Events with  $\alpha \geq 0.02$  persisted 12 hours, 30 events persisted  $\geq 96$  hours.

The longest event with  $\alpha \geq 0.13$  persisted 18 hours and it occurred 1 time.

The longest event with  $\alpha \geq 0.02$  persisted for 1 month or more and it occurred 14 times.

24 Events had  $\alpha \geq 0.01$  which comprised a total of 2,477 hindcasts.

2,659 Hindcasts were examined, and 2,641 had  $\alpha \geq 0.01$ .

Durations for a particular month extend from the time the event begins (or the first of the month if already in progress), and terminate when the event ends. Events become undefined if missing data is encountered. Durations lasting a month or more are categorized together. Durations may persist into the next month(s).

## ABBREVIATIONS (See text for details)

MAX: Maximum duration or interval, followed by the number of occurrences.

TE or TI: Total number of events or intervals.

T: Total number of hindcasts included in TE or TI.

T\*: Total number of hindcasts that met the stated criteria.

TH: Total number of hindcasts examined.

### INTERVALS - MONTHLY

- \* 18 12-hour intervals between events of wind speeds ≥ 7 kn. —————
- \* interval between events of wind speeds ≥ 7 kn. —————  
 occurred 96 hours or more.
- \* interval between events of wind speeds ≥ 7 kn. —————  
 occurred 1 time.
- \* interval between events of wind speeds ≥ 64 kn. was  
 more and it occurred 9 times.-----
- \* 32 intervals between events of wind speeds ≥ 4 kn.  
 comprised a total of 40 hindcasts. -----
- \* hindcasts were examined, and 40 had wind speeds < 4 kn. -----

For a particular month—extend from the time the event ends  
of the month if the event is not in progress), and termi-  
the event begins. Intervals become undefined if missing  
counted. Intervals lasting a month or more are  
d together. Intervals may persist into the next month(s).

SEQUENCE NUMBER 99																GRID POINT SUBPROJECTION NUMBER 999-9							
																6-1	1	1	1	2440			
																6-2	2	2	2	2440			
																18-1	12	19	19	2442			
																48-1	39	96	96	2446			
5		1		1												90-1	93	355	355	2448			
9	8	3	4	5	2	2	2	1								162-1	133	822	828	2477			
15	6	2	10	4	10	4	1	2	1	1	3	14				570-1	122	2035	2065	2787			
6	7	8	3	4	2	2	1	2	1	1	3	1	52			MO-2	99	2498	2593	2938			
5	3	4	2	4	3	2	3	1	1	2			50			MO 3	91	2702	2817	3058			
3	4	4	1	3	2	1	2	1			3		1	43		MO 6	74	2698	2813	2977			
1	4	4	2			1	1	3	2				1	36		MO 10	59	2814	2883	2977			
2	2							1	1	1				30		MO 14	37	2550	2696	2733			
				1	1	1					1			23		MO-16	24	2477	2641	2659			
24	30	36	42	48	54	60	66	72	78	84	90	96+	MAX	TE	T*	T*	T*	T*	TH				
																HOURS DURATION OF EVENTS							

with  $\alpha \geq 0.02$  persisted 12 hours; 30 events persisted at event with  $\alpha \geq 0.13$  persisted 18 hours and it occurred at event with  $\alpha \geq 0.02$  persisted for 1 month or more and 14 times. had  $\alpha \geq 0.01$  which comprised a total of 2,477 hindcasts. hindcasts are examined, and 2,641 had  $\alpha \geq 0.01$ . for a particular month extend from the time the event the first of the month if already in progress), and terminate the event ends. Events become undefined if missing data are. Durations lasting a month or more are categorized. Durations may persist into the next month(s).

Number of occurrences.

WAVE HEIGHT DURATIONS - MONTHLY  
SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

[illegible]

4 Events with wave heights  $\geq 6$  ft. (1.8m) persisted 12 hours; 22 events persisted  $\geq 96$  hours.

The longest event with wave heights  $\geq 3$  ft. (0.9m) persisted 1 month or more and it occurred 8 times. —————

The longest event with wave heights  $\geq 40$  ft. (12.2m) persisted for 6 hours and it occurred 1 time.

22 Events had wave heights  $\geq 3$  ft. (0.9m) which comprised a total of 1,524 hindcasts. -----

1,649 Hindcasts were examined, and 1,626 had wave heights  $\geq 3$  ft. (0.9m). -----

Durations for a particular month extend from the time the event begins (or the first of the month if already in progress), and terminate when the event ends. Events become undefined if missing data is encountered. Durations lasting a month or more are categorized together. Durations may persist into the next month(s).

SEQUENCE NUMBER 99 GRID POINT-SUBPROJECTION NUMBER 999-9

[illegible]

There were 18 12-hour intervals between events of wave slopes  $\geq 0.06$ ; 2 intervals persisted 96 hours or more.

The longest interval between events of wave slopes  $\geq 0.10$  was 474 hours and it occurred 1 time.

The longest interval between events of wave slopes  $\geq 0.15$  was 1 month or more and it occurred 18 times. -----

There were 6 intervals between events of wave slopes  $\geq 0.01$  which comprised a total of 12 hindcasts. -----

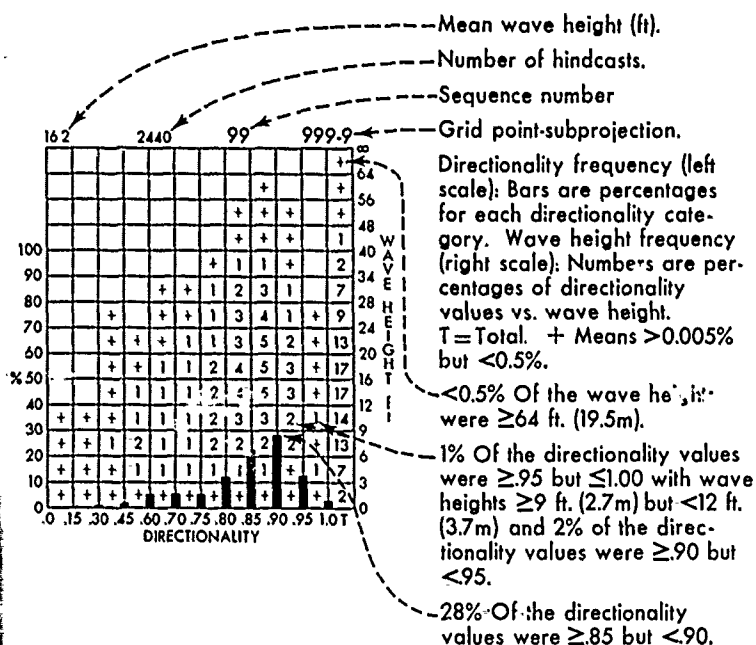
2,440 Hindcasts were examined, and 12 had wave slopes  $<0.01$ .

Intervals for a particular month extend from the time the event ends (or the first of the month if the event is not in progress), and terminate when the event begins. Intervals become undefined if missing data is encountered. Intervals lasting a month or more are categorized together. Intervals may persist into the next month(s).

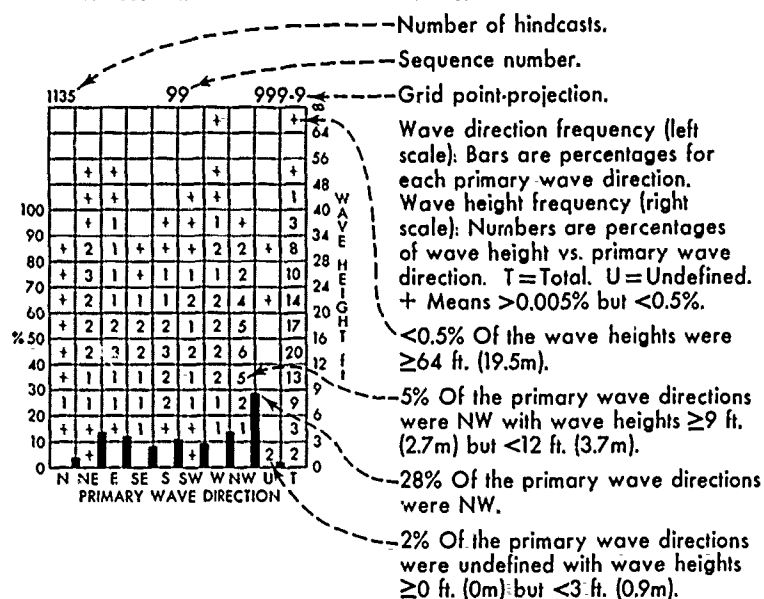
feet	meters
0	0
3	0.9
6	1.8
9	2.7
12	3.7
16	4.9
20	6.1
24	7.3
28	8.5
34	10.4
40	12.2
48	14.6
56	17.1
64	19.5

# LEGENDS FOR TABLES

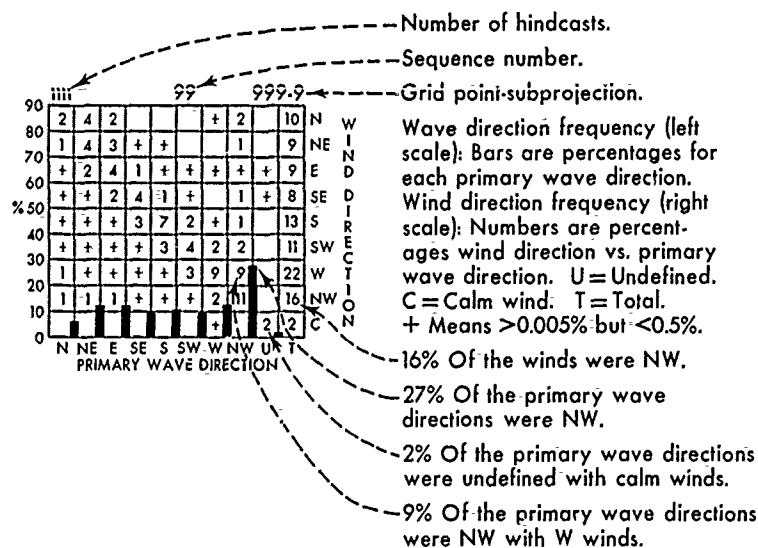
## WAVE HEIGHT AND DIRECTIONALITY



## WAVE HEIGHT AND PRIMARY WAVE DIRECTION

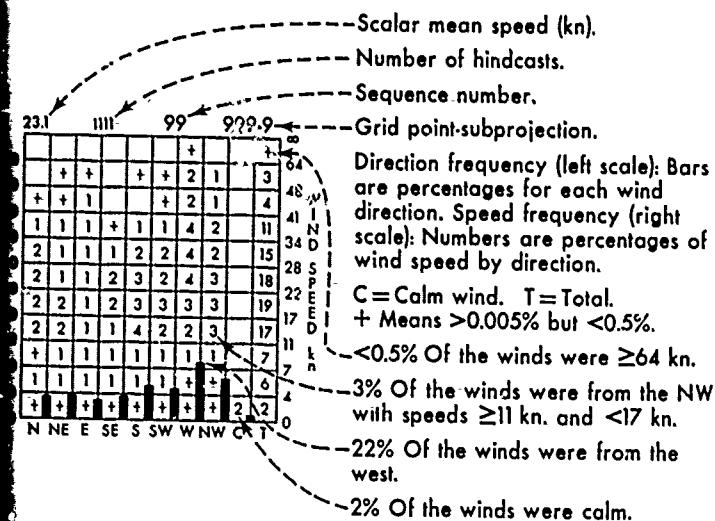


## PRIMARY WAVE DIRECTION AND WIND DIRECTION

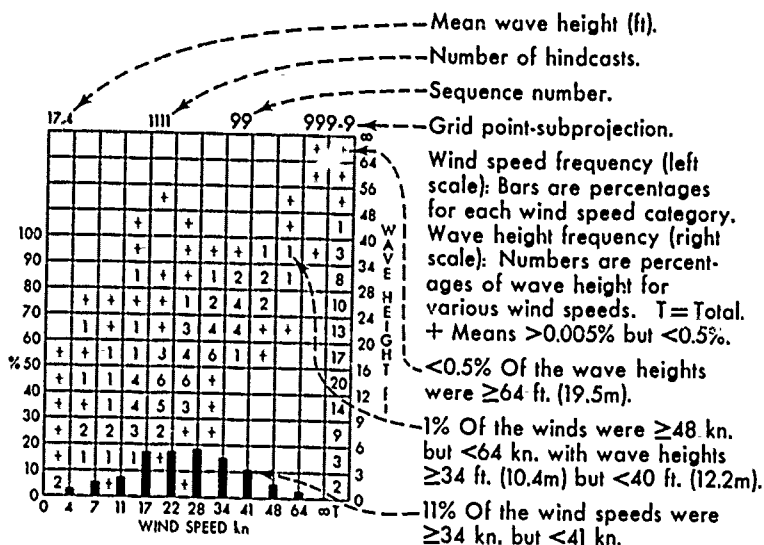


# LEGENDS FOR TABLES

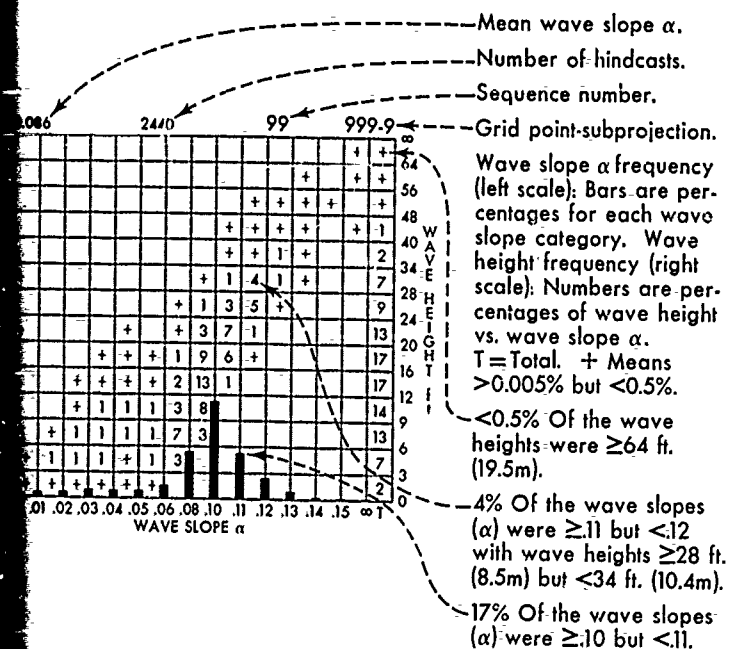
## WIND DIRECTION AND SPEED



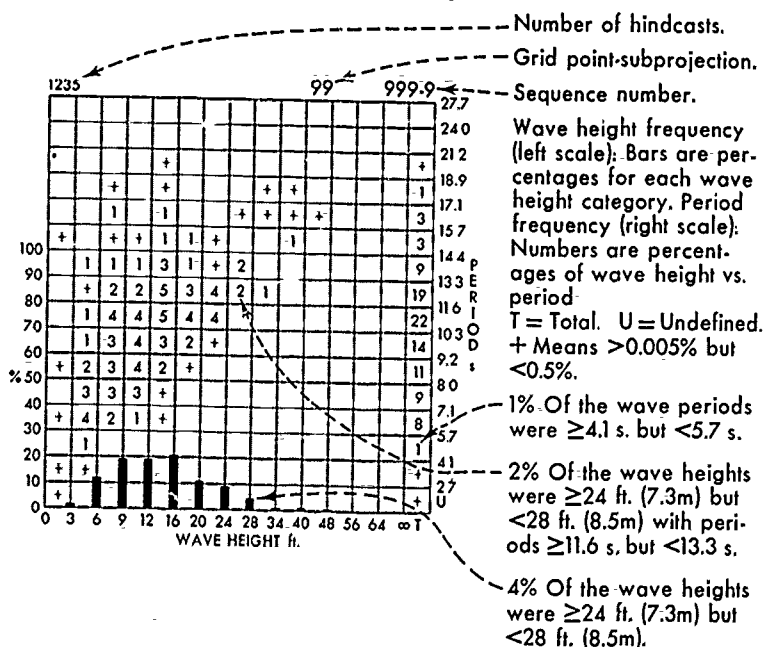
## WAVE HEIGHT AND WIND SPEED



## WAVE HEIGHT AND WAVE SLOPE $\alpha$



## WAVE HEIGHT AND MODAL WAVE PERIOD



feet	0.3	0.6	1.2	2.0	3.6	6.1	10.4	17.1	27.7	41.1	56.4	64
meters	0.1	1.8	3.7	6.1	8.5	12.2	14.6	17.1	19.5			